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THE INDEPENDENT GUIDE TO PERSONAL COMPUTING VOL. 17 NO. 4 FEBRUARY 24, 1998

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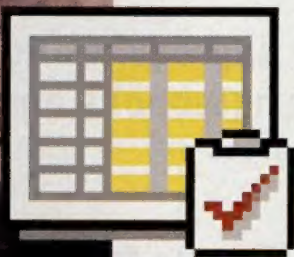
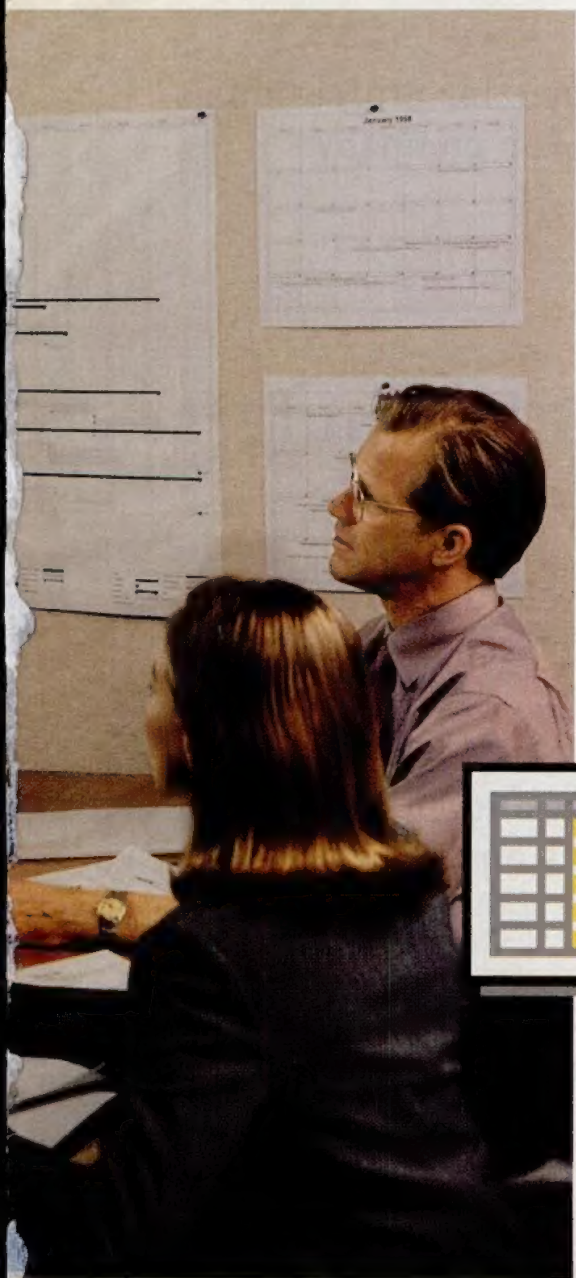
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-PC Computing, Dec. 1997



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Software-a-Rama



There's a theory going around that because Microsoft is such a dominant force in the software industry, all the innovation has gone out of PC software development. That's hogwash. I recently spent a couple of days with colleagues from *PC Magazine's* software team looking at dozens of programs that

were released in the past year. We jokingly called this event Softwarefest, and we were impressed with all of the products that we used. Many programs were from small companies. Some were Internet-related, but a surprising number were traditional productivity applications.

Here are a couple of standouts.

To begin with, I was impressed that a number of people are rethinking the whole idea of document production. One such person is Dan Bricklin, coinventor of the spreadsheet. He postulates that we've all gotten used to viewing articles that are in fact a series of linked pages, each one screen in size. But word processors are designed to produce linear documents, not linked documents. And though Web page editors are designed to create linked pages, they typically lack the control and formatting of word processors. Bricklin's response: Trellix, a product designed to let you easily create multiple-screen linked documents.

Design Intelligence also takes the position that documents are changing. The company offers iPublish, which separates the content of a document from its design. The result is a very different kind of desktop publishing paradigm. In this program, you can change templates, and suddenly your entire document will look different but will still flow correctly. In effect, iPublish borrows some concepts from presentation packages and applies them to desktop publishing.

Neither of these products may be for everyone, but they indicate that even the supposedly staid world of document production has come a long way.

Of course, there's innovation in many other categories as well. Companies like Dragon Systems, IBM, and Kurzweil (now part of Lernout & Hauspie) are

breaking new ground in continuous-speech recognition. This technology is advancing, as are optical character recognition (OCR) and handwriting recognition software, though they don't get the headlines they once did.

Perhaps the most underrated of these changes is taking place in translation software, as seen in products from Globalink and Systran. With

these packages, you submit a document written in another language such as French, Spanish, or German and the software translates it to English. You'd never mistake the translation for one done by a person who knows both languages. But you can get the sense of the document, which may be all you need. As this technology improves, it may change the way we communicate.

On the Internet front: Sure, the browser market may have come down to only two big players, Microsoft and Netscape. But a lot of work is being done on the fringe, like Alpha Microsystems' BusinessVue, is interesting. The program automatically pulls together data from multiple Internet sites, so it can gather strategic information about your competitors and their plans. Yes, you probably could find out more if you manually polled dozens of sites. But using a program such as SystemVue is a simple way to figure out what other companies are up to.

These programs are only the tip of the iceberg. We've seen great innovative software in everything from CD-ROM-based training programs to mapping. Enterprise resource planning (ERP) software from companies such as Peoplesoft and SAP has gotten a lot of attention, but there are also new programs—often extensions of accounting packages—designed for and by smaller companies.

So the next time people suggest that all the innovation in software has been reduced to that coming from Microsoft, tell them to take a peek at small software companies. They just might be amazed at what they find.


MICHAEL J. MILLER

Online Finance: Essential Internet Services

BY JAN OZER

No surprise here: The Web turns out to be an especially rich resource for helping you deal with life's biggest financial decisions. We review seven multipurpose finance Web sites that deliver information and interactive services in five key areas: insurance, investments, home buying, retirement, and taxes. We also look at sites that specialize in each of these areas—and in most cases go above and beyond what the multipurpose sites offer129

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TAX SOFTWARE

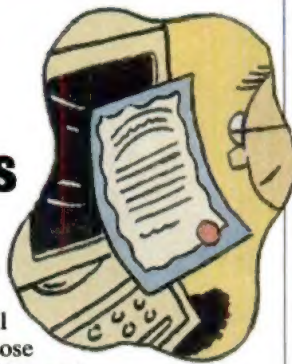
Taming the 1040



BY KATHY YAKAL

Like desktop finance, the tax software market has dwindled to two major players: TaxCut Deluxe and TurboTax Deluxe. The new version of each program has the usual new features, but otherwise they're not much changed. Also, delayed enactment of new tax laws has made the release of these programs run late287

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Graphics Workstations

BY DAVID S. LINTHICUM

Don't look now, but some high-end Wintel PCs just jumped past the low-end Unix workstations on the market today in performance. Even thinking such a thought is sacrilege in traditional Unix circles, yet the proof is in our pages. Unix still rules in some areas, but the times they are a-changin'148



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WEB-BASED DISCUSSION SOFTWARE

Meeting of the Minds

BY GREG ALWANG

They've been doing it on the Internet for years. Now, getting people "talking" in text-based forums and discussion areas at Web sites and on company intranets is quickly becoming an essential part of doing business in the online age. But that's only because it's an excellent way for businesses to stay in touch with customers and employees. We review ten packages aimed at helping you set up an effective discussion area.....179

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Pipeline



What About Windows 98?

In the wake of a recent temporary federal injunction against Microsoft's practice of requiring PC makers to include Internet Explorer with Windows 95, many analysts have called the ruling a potentially severe blow to the upcoming Windows 98.

Rick Sherlund, a software industry analyst at Goldman Sachs and Co., says that if Microsoft can't integrate its browser with Windows 98, the result will be "a real lobotomy of the operating system."

Although it's not yet clear exactly how Windows 98 would be affected, there's no question that browser integration is the product's key selling point. Justice Department officials have interpreted the ruling to mean that Microsoft must decouple its Web browser from Windows 98.

The intention in Windows 98, due in the middle of the year, is to integrate the browser right

down to the plumbing level of the operating system. For example, push technology (which brings Web content directly to the desktop) is a key part of Microsoft's plan, and many system-level utilities would be fully integrated with the browser.

The ruling notes, "Microsoft's counsel conceded that [it] could not declare that certain of its other products, such as 'Word' and 'Excel,' are 'integrated elements' of its operating system..." It is unclear what distinguishes those particular products from Internet Explorer.

A court-appointed investigator, Lawrence Lessig, is weighing the issues. His input will have huge bearing on whether Microsoft can follow through on its Windows 98 plans. Lessig is expected to complete his report in late May. Until then, a long shadow will be cast over the next versions of Windows and Windows NT.

Appliance Clients

If Oracle chief Larry Ellison has his way, "appliance clients" will bring many more people to the Internet—and soon. Citing the prohibitively high cost of computers, Ellison sees the need for an alternative. "When network computers are under \$200, you get universal access, not just for the elite few," he says. Several appliance clients are in the



works, including a \$199 product from RCA that provides Internet access via a cable-wired TV. Worldgate Communications and Zenith Electronics have similar offerings.

On the corporate side, Ellison looks to the development of better, more powerful server technology to reduce the number of servers that companies need. "The objective is to consolidate, not centralize," he says. As an example of such technology, Ellison highlights work Intel is doing on an eight-processor server.

"Microsoft might acquire yet another monopoly in the Internet browser market, and the probability is too great to tolerate indefinitely until the issue is finally resolved."

—Federal Judge **Thomas Penfield Jackson**, explaining his temporary injunction against Microsoft.

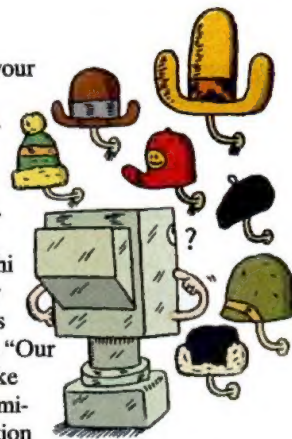
Adaptive Chips

Each and every software application on your system has specific needs. Your word processor, for instance, requires only minimal multimedia and computational resources; Web browsers and games, on the other hand, may need a maximum of both.

To help computers allocate resources more efficiently, professors Fadi J. Kurdahi and Nader Bagherzadeh at the University of California, Irvine, are looking into ways to let computer chips change dynamically. "Our approach is to use computer power to make chips extremely flexible, so they can dynamically adapt their structure to each application they run and execute that application as efficiently and as quickly as possible," says Kurdahi. According to Bagherzadeh, the technology should take five years to come to fruition.

Recent advancements in manufacturing processes that have increased the number of transistors per chip are key to the technology. The Pentium II, for instance, has 7.5 million transistors; Intel's next-generation chip Merced will contain nearly 30 million. Kurdahi and Bagherzadeh look to the day when a chip can have 1 billion transistors.

President Clinton recently announced steps to fund this and other university projects to develop so-called billion-transistor chips. "These chips will be no larger than my fingernail, but their computing power will be 25,000 times greater than this entire mainframe computer," he said. Through the Defense Department, the government is supporting this effort to the tune of \$14 million.



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Faces Come to Life on the Web

First there was streaming audio. Then came streaming video. And now there's streaming 3-D. A tiny company called Real Time Geometry (RTG) has developed an innovative hardware and software solution that transforms 2-D images into compact 3-D images that can be delivered efficiently over the Web, spun around, and viewed from any angle. The applications range from online catalogs that let you try clothes on a 3-D image of your body, to plastic-surgery previews.

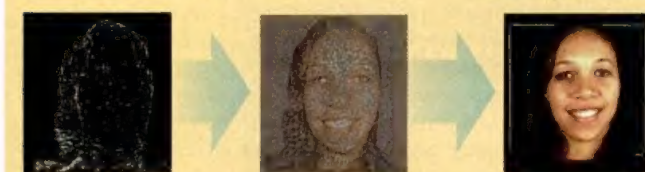
The idea sprang from the astronomy research of ex-Soviet scientist Alexander Migdal. He repurposed technology that he'd created to derive distances between stars, to transform the Web from a flat, lifeless 2-D world into a more compelling 3-D world. His RealScan 3D, which uses a 3-D scanner and a browser plug-in, has the



- 1 The 3-D scanner captures color and geometry data in half a second.
- 2 The laser digitizer produces a high-res image with 30,000 polygons.



- 3 The RTG software selects the important points and reduces the image to 6,000 polygons.
- 4 In the reconstructed trixel image, each vertex is assigned a color.
- 5 The final 3-D model, which shows no degradation, can fly over a modem...



... and be viewed at any angle.



graphics community salivating. In fact, graphics powerhouse MetaCreations bought RTG in 1996.

RealScan 3D, available in February, includes the 3-D Photo Scanner, essentially a digital camera souped up with a laser beam so it can produce a digital model of any object—a face, a football, a sneaker. The resulting file consists of around 30,000 polygons and is over 200K. The software applies algorithms to pare the image down to a 20K (6,000-polygon) file, which can fly over a 28.8-Kbps modem.

The software turns the image into a *multiresolution format* called RTG, which is composed of *trixels*—triangles and pixels. The result is a single image in which the RGB color values are stored along with their x-, y-, and z-coordinates. The browser plug-in MetaStream reconstructs the 3-D image, displaying it progressively as it's streamed over the Web.

Product manager Dmitry Paperny predicts that in a few years, there will be simple attachments that turn digital cameras into 3-D scanners.

THIS ISSUE'S CONTRIBUTORS: Angela Hickman, Carol Levin, Alfred Poor, Sebastian Rupley, and Don Willmott.



Internet Shakeout

America Online CEO Steve Case predicts a shakeout in the Internet industry, similar to the one that occurred in the software industry in the 1980s. "It's clear that a shakeout and consolidation will happen over the next year or so," he says.

Case compares today's climate to that at the birth of the software industry, which grew to thousands of companies and then dwindled to hundreds, then to dozens, and finally to just the handful of companies that truly impact the software industry today. "The same kind of thing will happen in the Internet industry. The only way to preserve business is to serve Main Street rather than Wall Street," he says.

AOL has grown from 400,000 subscribers four years ago to over 10 million subscribers today. It has reinforced its customer support lines for a total of over 5,500 people, who handle some 1 million complaint calls a week. According to Case, "The industry is not yet where it needs to be in terms of making the Internet accessible and easy."

Top Retail Business Software

1	Microsoft Windows 95 Upgrade Microsoft
2	VirusScan McAfee
3	Norton AntiVirus Symantec
4	UnInstaller Cybermedia
5	Microsoft Internet Explorer Plus Microsoft
6	FirstAid 98 CyberMedia
7	Norton AntiVirus Deluxe Symantec
8	Norton Utilities Symantec
9	Netscape Communicator Netscape
10	Dr. Solomon's Anti-Virus Dr. Solomon

Source: PC Data. Data for November 1997.

LCD Panels Unplugged!

Reach over and unplug your monitor—and your display will fade to black. Turn off the power to your notebook's LCD panel and the image will disappear. New "bistable displays," from Kent Displays, make it possible to cut the power after the on-screen content has been updated, which could result in significant power savings.

In a bistable display, power is required to address the cells in order to make them change their states, but once a cell is set, it will stay that way indefinitely.



Death of a Computer

What it costs to bury an old PC.

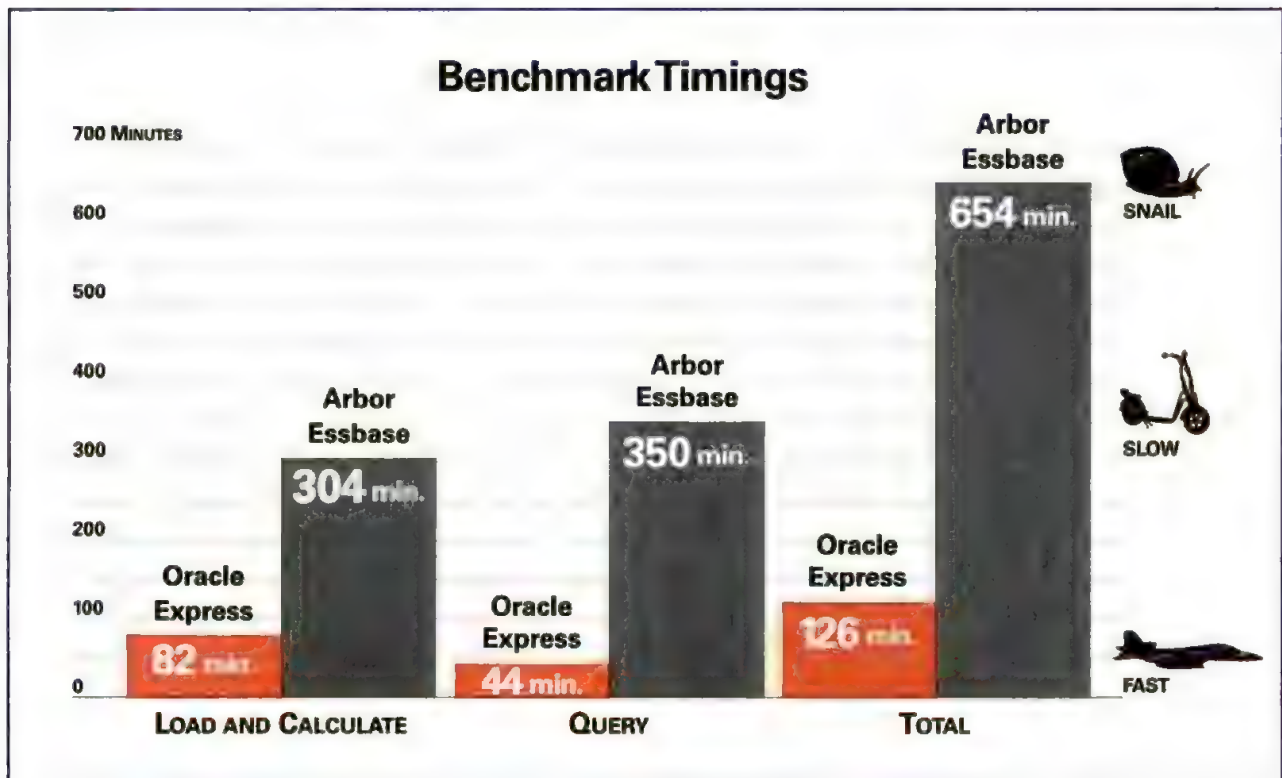
Selling a PC to a broker	\$118.90
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Discarding a PC accounts for 3 to 5 percent of the total cost of ownership. This includes the costs of disconnecting cables and peripherals, wiping the hard disk clean, and removing the system, plus varying expenses such as record keeping and accounting.

Source: International Data Corp.

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Letters

THE SEARCH IS OVER

I liked your review of Internet search engines ("Your Complete Guide to Searching the Net," December 2, 1997), but some mention should have been made of the fact that several Web indexes, such as Infoseek, have banned many free Web-hosting domains from their indexes. When I search the Web, I'm looking for information—not marketers, big-business sites, or anyone whose primary intent is to sell me a product. Before these bans were imposed, I would consistently find just what I was looking for on free, personal Web pages; the pages that left me the most satisfied were those in free-hosted domains such as Angelfire, GeoCities, and Tripod.

BILL WEBB
Chicago, Illinois

When I read the section "How We Tested," I couldn't believe that you didn't include examples of how you worded your queries. I thought that the most important part of searching the Web was how you word a query. How about some examples next time?

D. SADLER
via the Internet

Your article was informative, but I must question your selection of Four11 as the best people finder. You cite Four11's "superior searching" and ease of use as well as its rich search options. This is all well and good, if you can find what you're looking for. Months ago, I removed my bookmarks for Bigfoot, Big Yellow, Four11, Switchboard, WhoWhere?, and Zip2 in favor of InfoSpace. I have yet to be disappointed.

PAUL ZOROVICH
New York, New York

CADDIES

I must comment on the First Looks review on low-cost CAD ("A Whole New Side to CAD") in your December 2 issue, which I read with more than just a passing interest. You compared many of the low-cost CAD packages with full-blown AutoCAD, not with AutoCAD LT 97. For example, in your review of Vdraft, you comment that the package lacks "AutoCAD's robust 3-D capabilities," but so does AutoCAD LT 97. You go on to describe the lack of support for "AutoLISP, .ADS, or .ASE" in the package, but AutoCAD LT 97 lacks these capabilities as well. I also believe that LT 97 provides only relative input via the digitizer, just as Vdraft does. I think it would be more useful to compare these packages on a consistent basis with AutoCAD LT 97 rather than with AutoCAD, since their prices are 15 percent below those of full-blown AutoCAD.

JOHN LYNCH
via the Internet



*The most important part of
Web searching is how you
word a query.*

I have always counted on PC Magazine's impartial and professional reviews of new products. Those qualities seem to be missing in at least part of this CAD product review. After you take all of the non-Autodesk products to task for not being able to read AutoCAD Release 14 files, you say that the situation will be remedied when Visio IntelliCAD is shipped in the first quarter of 1998. This is an endorsement of a product that was obviously not ready to be tested with its competitors.

JO ANN MORSE
via the Internet

I was amazed at the lack of consistency among the reviews of the different CAD products. This is most apparent in the programmability comparisons. I have programmed many different CAD systems over the last 20 years and written programs for all of the reviewed systems except AutoCAD LT 97. The review quickly glossed over the fact that AutoCAD LT 97 has no programming capability, not even AutoLISP. Since none of the reviewed programs can run AutoLISP programs, it was strange that only in the case of Vdraft was this fact mentioned in a negative way. The review failed to mention that Imagineer and TurboCAD have extremely poor support for any language other than Visual Basic. Visual C++ programming is extremely difficult with either of these systems. Vdraft, on the other hand, is very easy to program in Visual C++, Delphi, or Visual Basic.

SCOTT TAYLOR
via the Internet

KEEPING OLD DATA TOGETHER

I found Seymour's comments about Microsoft Money 98 Financial Suite timely for the Christmas buying season ("Christmas PC Buying, Part I," December 16). I have used an older Intuit product for years and am ready for an upgrade. His article failed to address two major points for those considering a change to the Microsoft product, though. First, will Money 98 read in the data I have already entered into my Intuit program? This is not a trivial question, since I have ten years' worth of data on stocks and bonds, buy-and-sell transactions that I will have to pay taxes on one day. Second, how well does Money 98 interact with the Intuit TurboTax programs? If I must reenter data in April, then what do I have to gain by switching?

DARRELL MASSIE
Boulder, Colorado

It sounds as if you're pretty committed to Intuit's products, so you should probably stay with them. Money 98 is supposed to import all that old data cleanly, but when a data stream ten years old—or at least with data from that far back—is involved, I'm always wary.—Jim Seymour

APPLE GETS ITS DUE

Thank for taking the time to review the Apple Power Macintosh 6500/300 ("Right at Home," December 16). Why, you may ask, is Apple still a big shark? Simple: The company manages to survive and sell many computers despite a sea full of Wintel defenders who, when put together, have more teeth than Apple could ever dream of.

LUC SIMARD
Montreal, Quebec, Canada

The review of the Apple Power Macintosh 6500/300 was very well written and objective. You have restored my confidence in your magazine's ability to evaluate products based on merit.

ERIC H. SAND
via the Internet

READING THE FINE PRINT

Timing really is everything. Your article in the December 16 issue ("Right at Home") states that the IBM Aptiva S6S costs \$4,000 (street). An ad from IBM Direct in the December 2 issue states that the direct price for the same PC (similarly equipped) is \$3,349. This really shows that the consumer has to practice due diligence in this rapidly changing market segment.

GEORGE ANDERSON
via the Internet

MOM AND POP PCs

In your reviews and articles on home PCs (especially those regarding low-end PCs), you

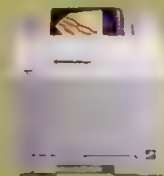




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Letters

have left out an important source—local vendors, such as those selling through the computer shows that are now common in most major metropolitan areas. Vendors selling through these shows and directly through advertising in local or localized publications offer consumers a lot of value for their money, albeit at the cost of uneven quality and performance. Although it would be impractical to review actual systems from these vendors in a national magazine, acknowledgment of their existence in a sidebar or an accompanying story, along with a profile of typical systems and pricing, would not be that difficult and would let consumers know of an important choice available to them.

SEQUOIA D. SCHROEDER
North Hills, California

DIGITAL DVORAK

I'm afraid John C. Dvorak's prediction that digital VHS will take the U.S. by storm (Inside Track, December 16) will eventually be proven wrong. I agree that D-VHS will offer superior quality to today's VHS standard and may even rival DVD, but we've seen higher-quality products fail before. I don't believe that most consumers will upgrade simply for better quality. People will pay for convenience, as is proven by pizza delivery, pay-per-view, and drive-through pharmacies, but most people will not pay for better performance alone.

HAROLD LILES
via the Internet

In today's market, the industry has a hard time selling a \$300 VCR, let alone one costing several times that amount. D-VHS is just another solution looking for a problem. It's a tape

CORRECTIONS AND AMPLIFICATIONS
In our December 16 review of Adobe FrameMaker 5.5 (Second Looks), we mistakenly referred to a plug-in called HoTMetaL, which is an HTML authoring product from SoftQuad. The product that should have been named is HoTaMaLe, a plug-in for Adobe FrameMaker that enables you to convert documents to HTML. Details on HoTaMaLe are available at www.adobe.com/supportservice/custsupport/NOTES/2432.htm.

In our December 16 cover story, "The 14th Annual Awards for Technical Excellence," we misspelled the URL for Internoded Inc. (www.internoded.com, 617-876-4007), a consulting firm specializing in Lotus Notes/Domino, Internet, and multimedia applications. It developed our discussion databases for both our Technical Excellence Awards and "The Best of 1997" (January 6, 1997). In the same story, the phone number for NEC XtraView, a finalist among *displays*, was wrong. The correct number is 800-632-4636.

format with all the liabilities of tape: stretching, dropouts, and mechanical shells with many moving parts. DVD will make D-VHS into just another oddball format.

ELLIOT BAIN
via the Internet

BABY STEPS

Bill Howard's December 16 column ("The Way It Wasn't") was very good. But upgrade frenzy is a sinister, overly effective marketing device. A particular upgrade might be wonderful, but once a person becomes proficient and productive using an older product, why change? I counsel novice computer users to buy the cheapest PC they can find. The second computer is the one to be picky about; the first one is merely a learning tool. There is no point in investing a lot of money in a product that depreciates at warp speed. It is much smarter to buy what serves your purpose now. Remaining 2 or 3 steps back from the bleeding edge is good policy for people who truly need advanced features. For the rest of us, staying 10 or 20 steps back is just fine.

CARLA SCHRODER
via the Internet

UM...BELIEVE THE HYPE

I enjoyed your article on 56K modems ("Fast Connections for All?", October 21, 1997). I thought it was well written, discussing both the pros and cons of this new technology. I read the responses to the article in the December 16 issue (Letters, "Don't Believe the Hype"), and judging by these letters, you'd think no one can connect any faster with these new modems. Well, I am one who can. And I'm sure others can, too. I connect via Pacific Internet in Ukiah, California, a town of 20,000 people located approximately 2 hours north of San Francisco. I connect at 52 Kbps almost all the time, and I never connect below 50 Kbps.

MIKE COOK
Redwood Valley, California

My experience with 56K modems has been very different from the experiences of your readers. It is telling that none of the correspondents seem to have used 56K modems themselves. The readers' feelings about the products appear to stem from their interpre-

tation of what they had read, not what they had actually experienced.

ERIC EMREY
via the Internet

I own a U.S. Robotics Sportster internal 56K fax modem and have had outstanding success with it. I regularly connect at 52 Kbps and often see the legal limit of 53.3 Kbps. IBM Global Network is my ISP, and it offers excellent help with 56K problems.

JEFF CALLERY
Groton, Connecticut

HOME CONTROL

Bill Machrone's column "Better Homes and Gadgets" (December 2) touches on an area that has intrigued me ever since the X-10 was available for the TI-99/4A. I've long thought that a computer-controlled home management system could offer a scripting function that could keep track of which devices are turned on or off and when. Then the controller could be put into a security mode that repeats the irregular pattern while the homeowner is away. One necessary element would be two-way communication between the slave unit and the controller. (I'm not sure whether current signaling protocols are one-way or transmit both ways.) This type of "killer app" may convince people that computer-controlled home management systems are more than gadgeteers' toys.

RICK VAN DUSEN
via the Internet

INCONVENIENT CONVENIENCE

Your article on shopping online ("Let's Go Shopping," November 18) came at a propitious time for me. I needed to buy a birthday gift and saw that Fortunoff is on the Web. I found a beautiful necklace at the store's site and ordered it. Since I was a bit late, I paid the extra money for two-day delivery. Imagine my chagrin when I received a phone call from Fortunoff four days later informing me that the item was not in stock, nor would it be in the near future. I learned an important lesson from this experience: Just because the site has a picture of an item doesn't mean it's available.

GREG PERLSTEIN
via the Internet

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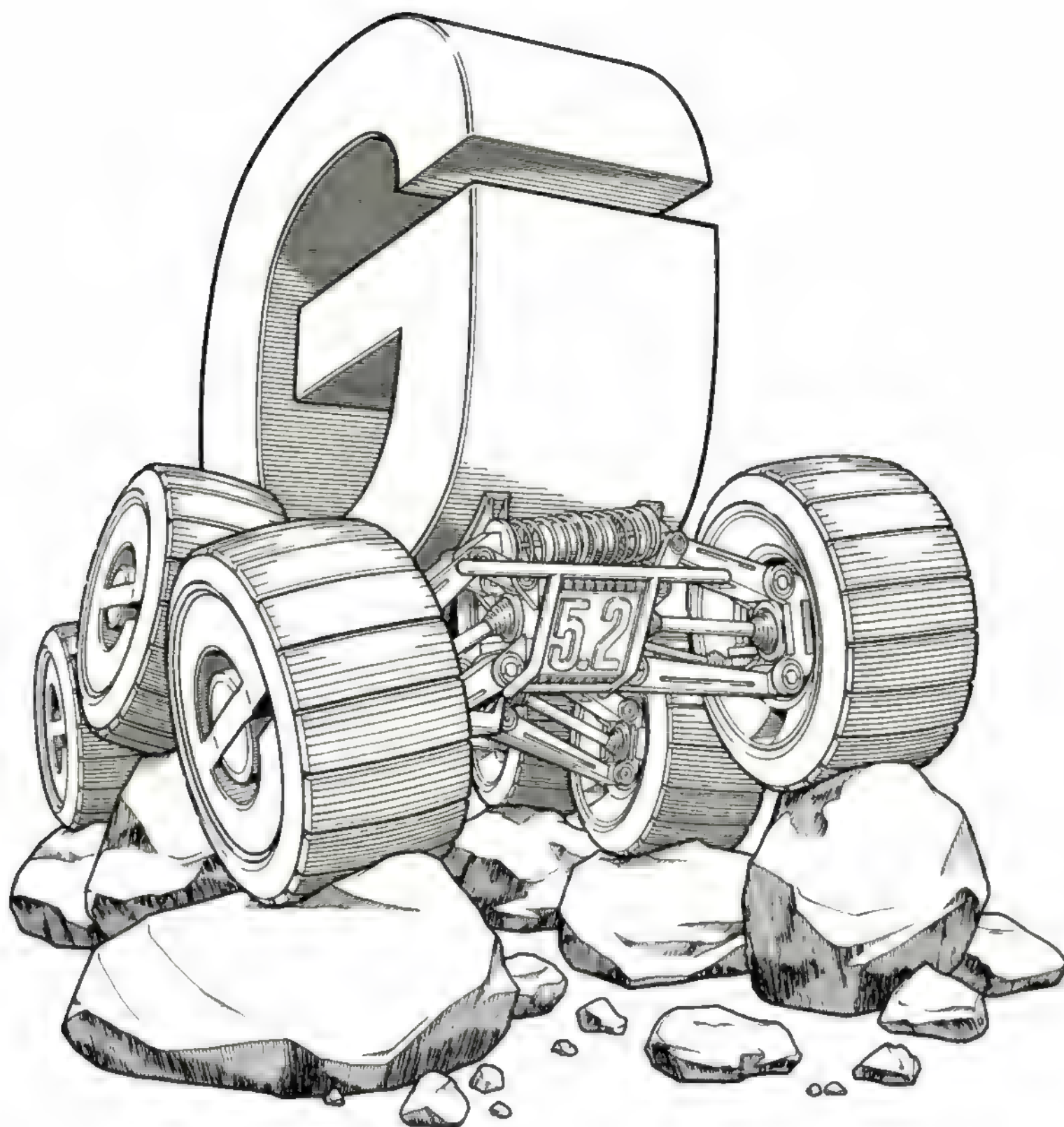


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Trends



The Business-Class Net

So you want to run your own phone company? Net telephony could be the answer.

Bellcore, the former research arm of the Regional Bell Operating Companies (RBOCs), has more experience in building operating-system software than even Microsoft. Until its recent acquisition by Science Applications International Corp. (SAIC), Bellcore devoted its expertise to writing software to run the public phone network, but now it's turning its attention to software that can let virtually any company run a phone system over an IP network.

Now that it's under the wing of SAIC, Bellcore is no longer restricted from competing with the RBOCs. Its new division Soliant Internet Systems is geared up to make Internet telephony a serious alternative to the existing phone network. "The goal is for Bellcore to do for Net voice what it did for analog technology," says Jac Simensen, vice president and general manager of Soliant.

BUILDING BRIDGES

Early this year, Bellcore plans to announce an architecture for "hand-set-to-handset telephony," designed to let businesses use the Net to carry voice calls that cost much less than they would over the phone network. The software will bridge public switched telephone-network signaling and IP telephony signaling.

The objective—and the challenge—is to use the Internet as if it were an integral part of the phone network. Merging the two networks, says Carl Silva, Soliant's executive director of service management and

signaling solutions, opens up a wide assortment of enhanced services not possible over two separate networks. "If anybody is going to make it happen, Bellcore is in a great position," says Dan Taylor, director of global telecom research at the market research firm Aberdeen Group.

The technology could also let any company that owns or leases fiber lines offer IP telephony services. To ensure quality, Bellcore imposes service standards on companies that want to run the software on their IP networks, explains Silva. Such companies could include an ISP, a new long-distance company, or even a multinational corporation that wanted to run its own phone service. "Anyone who meets the parameters can be in the business," Silva says.

"Leveraged services" would offer store-and-forward features that could, for example,

reroute a phone call as an e-mail message if your phone was busy. You could also set up a conference call that tied in a cell phone, a PC, a videoconferencing unit, and a regular phone. You would dial a two-number prefix to alert the switch that you were making an Internet call.

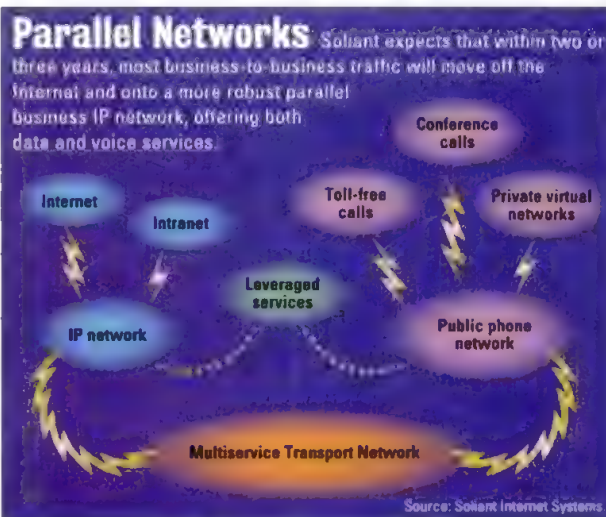
THE FREE-RIDE FALLACY

The system would essentially pay for itself, Simensen contends. "Instead of data riding on a voice network, voice rides for practically free over the data network. We can give you telephony almost for free," he says.

Some analysts disagree with that premise, though. "Voice doesn't ride for free over a data network," says Aberdeen Group's Taylor. "While most data networks are 90 to 95 percent reliable, the phone network is 99.99999 percent reliable. That difference is several orders of magnitude in terms of operational cost to provide that reliability," he explains. Providing the reliability expected for voice entails reinforcing the infrastructure, which increases the cost.

Internet telephony is relatively primitive today. *Propagation delay* and other shortcomings still exist. According to Simensen, Soliant has reduced the delay to 55 milliseconds—about the same as in a regular phone call.

According to telecom analyst Taylor, IP telephony could supplement the existing phone network but not replace it. The key challenge, he says, is to integrate IP telephony with the existing phone company.—Carol Levin



3-D Truce Declared

Microsoft and Silicon Graphics team up on technology for 3-D interfaces.

In a move with huge implications for graphical applications, Microsoft and Silicon Graphics have announced that they will work together on a set of new application programming interfaces (APIs) for 3-D software, ending their long-standing skirmish over how software developers should write code for 3-D hardware. The conflict had put developers in the difficult position of having to choose between Microsoft's standard Direct3D and Silicon Graphics' OpenGL 3D.

Microsoft had announced that it was abandoning Windows support for OpenGL 3D. Its plan was to evolve Direct3D so that the standard could compete with OpenGL, and it disbanded its OpenGL group, moving the members into its Direct3D group. Microsoft released Direct3D 5.0 last year.

But many players in the software community have grumbled that OpenGL is much more advanced than Direct3D, and they have called aggressively for Microsoft to support OpenGL. For Silicon Graphics, the deal to produce the set of APIs (dubbed Fahrenheit) is intended to let it introduce Pentium II-based Windows NT systems without giving up OpenGL. Microsoft, meanwhile, wants to keep from alienating game and hardware developers who prefer to write games and drivers for OpenGL. The companies will merge their low- and high-level APIs.

The main building blocks of 3-D images are triangles, and Direct3D is based on software-intensive execution of triangles' rendering logic. OpenGL, on the other hand, has a hardware-oriented approach to rendering triangles. The switch on the Windows platform to a hardware-intensive approach will have ripple effects on the whole 3-D graphics community, including vendors of graphics chips, boards, and software.

Silicon Graphics CEO Ed McCracken characterizes these effects as having huge significance over the next few years. "There will be an explosion of 3-D software over the next several years as vastly improved graphics chips arrive," he says.—*Sebastian Rupley*



The Dual-Chip Decision

ARE TWO CHIPS BETTER THAN ONE? NOT necessarily. Intel designed the Pentium II to accommodate dual-processor configurations, but you should consider your needs carefully before investing in a second processor.

In this issue's feature story "Graphics Workstations," we reviewed nine of today's most powerful Windows NT workstations equipped with two 300-MHz Pentium II CPUs. They competed favorably against entry-level Unix workstations on our benchmark tests, but our informal tests revealed that the extra money won't always return better performance. We ran our entire suite of workstation tests on the Compaq Professional Workstation 6000, first with one Pentium II processor and then with two.

Three factors limit the benefit of the second CPU. The most obvious is that not all applications are multithreaded. The Compaq system fared no better with two processors than with one on our ZD High-End Winstone 98 tests, which profile performance while the computer runs many popular high-end applications. And two of the most popular workstation applications, Pro/Engineer and AutoCAD, did not gain any performance improvement with two processors either, because neither is multithreaded.

Only select CPU-intensive applications—such as Softimage, Adobe Photoshop, and Kinetix's 3D Studio Max—take advantage of multiple processors. Even within these programs, only certain functions are multithreaded. In Softimage, for

example, Mental Ray rendering uses both processors, but OpenGL rendering runs only on the primary CPU.

The second reason two CPUs aren't necessarily better than one is that most operations are not completely CPU-bound. As the hard disk and the graphics subsystem take on importance in a task, the processor's contribution is diluted. In floating point-intensive 3D Studio Max scene rendering, our dual-processor configuration outperformed the single-processor one by 81 percent. But the gain was only about 10 percent in polygon rendering (Scenes 1 and 3)—which heavily involves the graphics card—and was only about 2 percent in texture throughput (Scene 5), which involves the graphics, disk, and memory subsystems.

Adding the second processor also introduces contention for the memory and system I/O bus. On our Photoshop Gaussian Blur and Unsharp Mask tests, the performance gains with the second CPU were 68 percent and 51 percent, respectively. But on the Photoshop RGB-to-CMYK Conversion test, which taxes the CPU/memory interface more heavily, the gain was only 24 percent.

Even if you use no multithreaded applications, you may benefit from a dual-processor PC if you often run multiple applications at once. A multithreaded OS—such as Windows NT 4.0—uses a multiprocessor kernel that automatically balances the load between the processors. A second CPU may be a worthy investment, but consider your applications before you leap.—*S. Jae Yang*

Compaq Professional Workstation 6000 ■ 1 processor ■ 2 processors

Softimage 3D Extreme Mental Ray Renderer	0.79 1.01
Softimage 3D Extreme OpenGL at 1,024 x 768	1.03 1.02
Pro/Engineer Train File	0.73 0.72
AutoCAD, Release 13C4 With Windows Driver	1.03 1.01
Adobe Photoshop Gaussian Blur	0.90 1.51
Adobe Photoshop Unsharp Mask	0.91 1.37

All scores are relative to the average performance of the nine workstations reviewed in this issue (1.00 being the average score). Larger scores represent better performance.

Adobe Photoshop Lighting Effects	1.03 1.03
Adobe Photoshop RGB to CMYK Conversion, 30MB File	0.55 0.68
ZD High-End Winstone 98	0.93 0.93
3D Studio Max Scene 1 (OpenGL)	0.52 0.58
3D Studio Max Scene 3 (OpenGL)	0.50 0.54
3D Studio Max Scene 5 (OpenGL)	0.59 0.61
3D Studio Max Scene Rendering (Floating Point)	0.58 1.05

HyperVideo Hits The Web

Video-based catalogs are poised to engage shoppers.

Established two years ago in Beijing, IBM's China Research Lab specializes in speech recognition and language translation for the Web, and the work there has already reaped some rewards. A specially adapted version of IBM's voice recognition software ViaVoice will be shipped with every PC in China, and the lab is now working on software to scan in Chinese text, recognize the characters, and publish directly to the Web. IBM researchers hope the technology will help liberate the content that's stored in Asia's archives and museums.

The lab's most recent invention is HotVideo, software for building hyperlinks into Web video. The breakthrough, explains IBM Digital Library director Willy Chiu, was the cre-

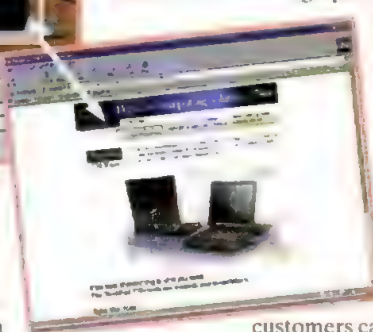


FREEZE-FRAME: IBM Research has developed technology for embedding hyperlinks directly into digital video.

ation of *metadata* that tracks objects in the video stream without placing extra stress on the system. IBM researchers came up with the video format—HVF—to describe the

link's temporal and spatial locations and the resources associated with it, explains Jeane Chen, manager of interactive media solutions at IBM's T.J. Watson Research Center.

HotVideo lets a Web publisher identify a hot link in a number of ways, such as outlining the object with a rule. A visitor to a Web catalog site, for instance, can then click on a model walking down a runway and instantly link to a transaction system to purchase the outfit. Or a link can lead to text, graphics, video, or an executable file.



Chiu expects that it won't be long before Web sites will offer video-based catalogs.

Publishers of DVD disks can also create video links to the Web so that

customers can download new content. CNN Interactive is one of HotVideo's initial test sites.—Carol Levin

JAKE KIRCHNER

Left-Handed Computing: A Sinister Plot?

My frustrating search for the elusive world of left-handed computing began when I thought to buy a Christmas gift for a special left-hander in my life. Turns out that left-handed computer products—mice, keyboards, joysticks, and the like—are as hard to find as “opposite-handed” scissors, potato peelers, and power saws.

I was surprised by the lack of left-handed computing products because for years, I've heard that left-handers are significantly more common in the world of personal computing than one would think, given their numbers in the general population. From 10 to 15 percent of Americans are left-handed, according to statistics I've seen.

Why there should be a high percentage of left-handers in high tech is not clear, and in fact the evidence to support the observation is merely anecdotal. Some argue that since left-handers are more intelligent and creative than the rest of us (they supposedly use both sides of their brains more effectively than right-handers), they gravitate toward exciting and intellectually challenging careers in personal computing and the Internet. This is a point made quite energetically at some of the many Web pages devoted to left-handedness (check out www.emf.net/~estephenn/facts/lefthand.html#essay).

Such sites abound with long lists of the great and talented people among left-handers—famous statesmen such as Alexander the Great, Julius Caesar, Napoleon Bonaparte, and Winston Churchill, for starters. More than a third of all U.S. presidents have been left-handed, including most of the recent ones: Gerald Ford, Ronald Reagan, George Bush, and Bill Clinton. And the list of artists, musicians, and actors who are left-handed would overflow this page.

Since my wife and mother are left-handed, I didn't need to be



persuaded that left-handers are special, multitasking, and highly intelligent. What I needed was not proof of their unique attributes, but direction to gifts designed specially for their uniqueness.

If you look hard enough, you can find a left-handed keyboard here and there. Dalco Electronics (www.dalco.com) offers two versions. And there are plenty of mice and trackballs from the leading vendors, such as Logitech (www.logitech.com) and Kensington (www.kensington.com), that either left-handed or right-handed persons can use. Also, in Windows you can switch the functions of the right and left buttons on your pointing devices, perhaps thanks to the influence of that noted southpaw Bill Gates. But the bottom line is that this is not an industry that caters to left-handers.

Is it any wonder, then, that the Web sites for lefties are replete with complaints of discrimination and even repression? Left-handers note that the words *gauche* and *sinister* come from the French and Latin words, respectively, for *left* and that *adroit* and *dexterous* come from the words in the same languages for *right*.

Of course, all those right-handed keyboards and mice don't really keep left-handers from using computers productively. As in every walk of life, left-handers find a way to adapt. And by necessity most left-handed people are fairly ambidextrous (from the Latin expression meaning, literally, that both hands are right hands).

Why this is important is not because I'm that worried about the left-handed people in the world, but because I believe technology at its finest and most advanced is liberating. It should give us more choices, not fewer. As hardware and systems vendors seek newer markets to fuel their growth, this is one niche that deserves special attention.

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- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality 334 AGP, 4MB SGRAM Graphics Card
- Altec Lansing ACS-90 Speakers
- 24X max Variable Speed CD-ROM
- U.S. Robotics x2 56Kbps* Winmodem™
- Upgrade to 128MB SDRAM Memory, add \$179
- Upgrade to 6.4GB Ultra DMA Hard Drive, add \$89
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- Iomega 100MB Internal Zip Drive with One Cartridge, add \$99
- Upgrade to Number Nine Revolution 3D AGP, 4MB WRAM, add \$149

Direction 233L

- 233MHz Pentium II processor
- 64MB SDRAM Memory
- 3.2GB Ultra DMA Hard Drive
- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality 334 AGP, 4MB SGRAM Graphics Card
- Altec Lansing ACS-90 Speakers
- 24X max Variable Speed CD-ROM
- U.S. Robotics x2 56Kbps* Winmodem
- Upgrade to 128MB SDRAM Memory, add \$179
- Upgrade to 4.3GB Ultra DMA Hard Drive, add \$49
- Upgrade to NEC C700 17" Monitor (16" viewable), add \$199
- Iomega 100MB Internal Zip Drive with One Cartridge, add \$99
- Upgrade to Number Nine Revolution 3D AGP, 4MB WRAM, add \$149

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From the leader in networking.



DESKTOP PCS

Up Toward Deschutes

Intel's 0.25 μ manufacturing process, introduced last fall with the mobile Pentium processor codenamed Tillamook, has now been extended into the Pentium II genre. With a shorter distance between each transistor and a smaller die size, the latest Pentium II—dubbed Deschutes after yet another Oregon river—runs at 333 MHz, which is faster than any other x86 processor to date.

With this issue's First Looks lead, we review eight Deschutes systems from six leading vendors: Compaq, Dell, Gateway, Hewlett-Packard, Micron, and NEC. In addition to these six, several other vendors—DTK, Intergraph, ProGen, and Quantex—are planning to offer 333-MHz systems shortly after Intel's chip announcement.

DTK Computer (800-289-2385, www.dtkcomputer.com), which primarily sells through dealers and VARs, is using the 333-MHz Pentium II in its **DTK Apri-76M/P333**, a \$2,940 (street) corporate system that comes preloaded with Microsoft Windows 95 (Windows NT for Workstations is available as an option). Equipped with Intel's latest P6 chip set—the 440LX—the machine integrates an AGP slot and uses a graphics card based on Intel's 2X AGP chip, the 740 (with 4MB of graphics memory). The rest of the core

system includes 64MB of SDRAM memory and a 6.4GB EIDE Ultra DMA hard disk. Other peripherals include a 32X max CD-ROM, an Intel 10/100-Mbps Ethernet card, a U.S. Robotics 56-Kbps modem, and two stereo speakers. Included in the price is a 17-inch monitor.

ProGen Systems (800-848-1353, www.progen.com), a division of ProGen Technology, is always quick to market with new processor hardware. The ven-

to 1GB), a 6.4GB Ultra ATA hard disk, 4MB of graphics memory, a 56-Kbps modem with voicemail, a 17-inch ProGen monitor, and Windows 95. A second Windows 95 model, priced at \$2,649 (direct), upgrades those specs to a 7GB hard disk and a 17-inch Panasonic PanaSync monitor.

The Polaris system that comes preloaded with Windows NT and

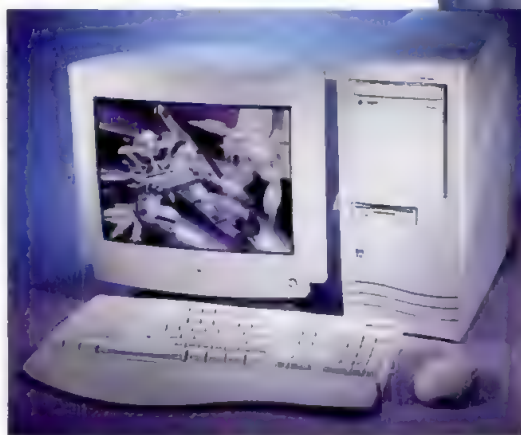
4x, part of the company's inaugural corporate line, lacks the Quantex SM's high-end sound card and 56-Kbps modem, but it ships with 3Com 10/100 Fast Ethernet and affords extensive remote management features.

Each DMI 2.0-compliant machine in the Quantex SB family meets Intel's Wired for Management specification and comes preloaded with QSentry Technology, a Quantex management package based on Intel's LAN-Desk Client Manager. Corporate IS departments can inventory and monitor each Quantex SB

from a remote console.

This management functionality is also available on the Quantex SM but is put to greater use on the Quantex SB, a system designed to connect to the business LAN. The SM comes with Microsoft Office 97 Small Business Edition, while the SB comes with Windows NT and Office 97 Small Business Edition.

Intergraph Computer Systems (800-763-0242, www.intergraph.com) plans to add the 333-MHz Pentium II to each of its existing lines, from the mainstream **Intergraph TD-225** to the high-end Intergraph TDZ 2000, a 3D graphics workstation. The Intergraph TD-225, typically a corporate option, is a tool-free ATX minitower equipped with EDO DRAM memory (up to 512MB), a 24X CD-ROM, and a 32-bit sound card. Graphics options are extensive, ranging from the Intense 3D Pro 2200—meant for high-performance 3-D CAD, animation, and visualization—to the familiar PCI-based Matrox Millennium II. Hard disk options include both IDE and SCSI models, while monitor options span the gamut from 15- to 21-inch designs.—Cade Metz



MORE DESCHUTES: 333-MHz systems from DTK Computer (left) and Quantex Microsystems (right).



has an 8GB hard disk, 64MB of SDRAM, 8MB of graphics memory, and the 17-inch PanaSync Panasonic monitor sells for \$2,799. All machines are accompanied by an ergonomic Microsoft Natural Elite keyboard, a Microsoft IntelliMouse, and a copy of Microsoft

Office 97 Small Business Edition.

Quantex Microsystems (800-346-6572, www.quantex.com), which sells its PCs direct only, is offering Deschutes systems from both its SM consumer line and its new SB corporate line. The \$2,749 **Quantex QP6/333 SM-4x** has a 333-MHz Pentium II processor with 64MB of SDRAM, an 8.4GB Ultra ATA hard disk, and a Permedia 2 AGP solution with 8MB of graphics memory. This ATX machine—which also houses a 32X max CD-ROM, a K56flex modem, an Ensoniq 32-bit sound card, Altec-Lansing ACS 45 speakers with subwoofer, and two USB ports—is accompanied by a standard keyboard, a Microsoft IntelliMouse, and a 19-inch monitor.

The \$2,699 **Quantex QP6/333 SB-**

dor's first Deschutes offering will be the **Polaris PII333**, which is targeted at corporate and SOHO power users. This 333-MHz model is also outfitted with the 440LX chip set and AGP support, but it uses a Matrox Millennium II AGP solution rather than the Intel-based card provided with the DTK Apri. Though the Millennium II benefits from AGP's 66-MHz bus, it lacks such features as AGP texturing and sideband data transfers. The system's 32-bit audio subsystem is augmented by two 80-watt stereo speakers, a subwoofer, and a microphone.

There are three versions of the Polaris available. The least expensive Polaris, priced at \$2,349 (direct), comes in both AT and ATX sizes and is outfitted with 32MB of SDRAM (which you can upgrade

RECAP PC Magazine last reviewed PCs in our issue of December 2, 1997. The Dell Dimension XPS D266 and the NEC Direction SPL266 were awarded the Editors' Choice for Professional/Enthusiast PCs. In the Corporate PCs category, the IBM PC 300PL and the Compaq Deskpro 4000 6266X/3200/CDS were awarded the Editors' Choice.

FINANCIAL SOFTWARE

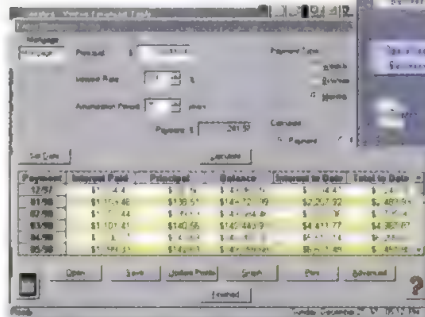
Personal Finance Sidelines

After facing the overwhelming popularity and product muscle of Intuit Quicken and Microsoft Money, most personal finance products have opted to enter niche markets that complement the competition.

Whereas Quicken Home and Business 98 focuses on helping people already running a small business, **Quicken Small Business Expert** (800-223-6925, www.parsonstech.com), from Parsons Technology, focuses more on determining whether owning a business is right for a potential owner. An interview process helps potential owners decide which type of business (partnership, corporation, Limited Liability Company, etc.) to set up.

The \$29 program generates the business and marketing plans necessary for securing financing and produces a cash-flow analysis. It provides the state and federal forms needed to start a business, including registration, OSHA, employee reg-

istration, and sales tax. The forms are specific to the state in which the business would operate. QSBE includes online links to such local resources as the Small Business Administration. It also gives information on



HELPERS: Vorton Financial Tools (left), Quicken Small Business Expert (above).

legal, employment, tax, and accounting issues. Links to Quicken Business Law Partner help the owner obtain complementary legal documents.

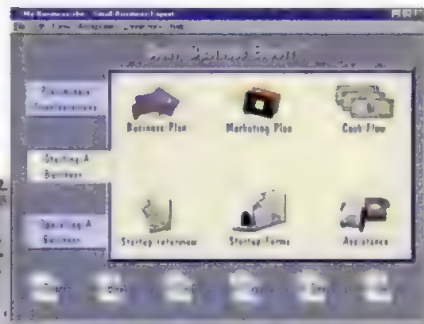
Village Software's original **FastStart Personal Success Pack** is a collection of personal finance spreadsheets. Considered an adjunct to

Quicken and Money and not an add-on, FastStart focuses on a series of specific financial tasks. It includes diverse spreadsheets that cover asset location, closing costs, home improvement, household

ment, borrowing costs, a capital gains worksheet, a credit card payment plan, a life insurance worksheet, mutual-fund costs analysis, present and future value, short-term insurance analysis, and yield to maturity.

The \$29.95 **Vorton Financial Tools** (613-721-1107, www.vorton.com), from Vorton Technologies, aims to provide quick financial calculations. Vorton is a comprehensive software application designed to help individuals analyze and make decisions in the area of personal finance.

Vorton Financial Tools offers retirement planning, savings calculators, advanced calculators for determining present and future values, as well as mortgage, loan, and bond calculations. The program's financial wizard, a financial glossary, and extensive help files are designed to simplify the process. And password protection provides extra security for financial information. —Sharon Nash



inventory, mortgage qualification, mortgage refinancing, mortgage amortization, net worth, personal budget, retirement plans, retirement budgets, and tuition plans. The follow-up package, the \$29.95 **FastStart Personal Success Pack II** (800-724-9332, www.villagesoft.com), adds several new features to that roster, including a bill divider, an auto-expense state-

signed for Windows 95 and Windows NT, EndNote takes a slightly different approach by offering a built-in search client, which eliminates the need to import references into your bibliographic database. Over 100 connection files link you directly to such resources

as university card catalogs, the Library of Congress, and a range of subject-specific databases, including Medline, PsycInfo, and Chemical Abstracts. Once a citation has been located, you simply drag and drop the reference into your local

EndNote database. You can also launch a Web browser from within the program in order to retrieve the full text of a desired article. —Melissa J. Perenson

REFERENCE

Bibliography Makers

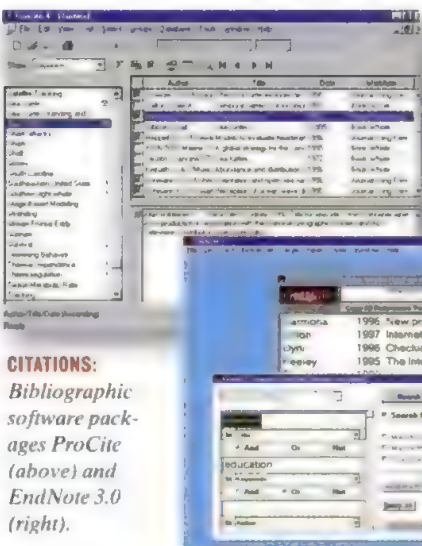
When working on a research project, keeping track of your sources and references can be tedious—regardless of its scope. Helping you through this task are two packages that ease the process of creating your research bibliography.

Research Information Systems' \$395.95 **ProCite Version 4 for Windows 95/NT** is the first 32-bit version of this bibliographic software (800-722-1227, www.risinc.com). ProCite, which now has a full drag-and-drop interface, is a database that's designed to help you import, manage, and store your reference information. You can generate multiple databases to correspond with your projects and print your bibliographies directly

from ProCite, publish your ProCite bibliography to HTML, or link to Microsoft Word 97 or Corel WordPerfect 8.0 to generate those bibliographies from within word processors.

Importing data into a ProCite database is simplified by the integration of Biblio-Link, formerly a standalone file-transfer utility that now functions as an import filter within ProCite. The program lets you import references from online services and Web reference sites, including Current Contents, Medline, Ovid, Web of Science, and Dia-

CITATIONS: Bibliographic software packages ProCite (above) and EndNote 3.0 (right).



log. New reference types include Web pages and e-mail.

Meanwhile, Niles Software offers the \$299 **EndNote 3.0** (510-559-8592, www.niles.com). Also de-

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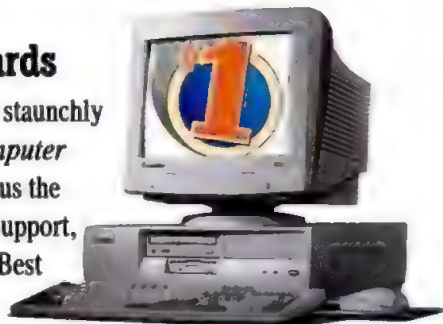
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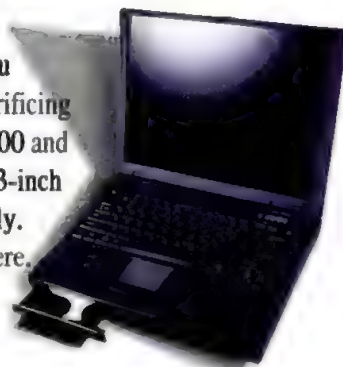
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It's no secret Gateway customers are staunchly loyal. We'd like to thank all the *Computer Shopper* readers out there who gave us the nod for their 1997 Best Service and Support, Best Place to Buy a Desktop PC and Best Value Desktop PC awards.



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Gateway Solo 9100, Home Office Computing and Small Business Computing 1997 Editors' Pick

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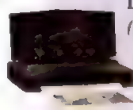


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- Intel LANDesk® Client Manager 3.01
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- Four 32-Bit PCI, One EISA, Two PCI/EISA Slots
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- 2GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Desktop Case
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- 6.4GB 10ms Ultra ATA Hard Drive
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- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
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GP6-233

- Intel 233MHz Pentium II Processor with 512K Cache
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- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 8MB 3-D AGP Graphics
- 4GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
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Gateway GP6-233, PC World Power Desktop, October 1997

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- 13X min/32X max CD-ROM Drive
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PC World Best Buy September 1997

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- nVidia 4MB 3-D AGP Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
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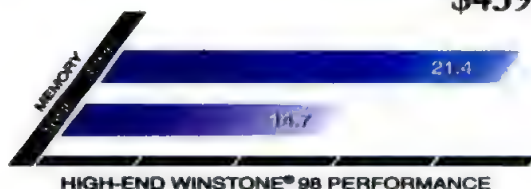
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(Tests conducted on G-series multimedia system with the MS Windows 95 operating system.)



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- PalmPilot™ Personal Data Organizer **\$249**
- Hewlett®-Packard ScanJet 5Pse Color Scanner **\$299**
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- Epson® Stylus® COLOR 400 Ink Jet Printer **\$199**
- Hewlett-Packard DeskJet 694C Color Printer **\$269**
- Epson Stylus COLOR 600 Ink Jet Printer **\$269**
- Hewlett-Packard LaserJet 6Lse Laser Printer **\$399**
- Epson Stylus COLOR 800 Ink Jet Printer **\$399**
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Market-leader InFocus (800-294-6400, www.infocus.com) is now offering the \$5,999 **In Focus LP420**, an SVGA projector that uses Texas Instruments' Digital Light Processing (DLP) technology rather than the more standard LCD panels. The In Focus LP420 weighs just under 7 pounds, and its compact design (3.9 by 9.0 by 12.0 inches) lets it fit under an airline seat. The unit can accept input from any PC, VCR, DVD, laser disc player, or video game station, and it is rated at a bright 500 ANSI lumens.

Epson America (800-463-7766, www.epson.com) has announced two new entries to its PowerLite line of LCD projectors. The \$8,499 **PowerLite 5000XB** is a 14.5-pound SVGA-resolution unit with a rated brightness of 750 ANSI lumens. The \$11,999 **PowerLite 7000XB** can generate 650 ANSI lumens, has native 1,024-by-768 XGA resolution, and weighs 14.7 pounds. Both Epson projectors have a contrast ratio of 300:1 and can support vertical refresh rates of up to 85 Hz for sharp, flicker-free images. Each projector includes built-in stereo speakers, and a remote control.

Philips Electronics (800-504-9978, www.philipslcd.com) recently unveiled two new versions of its high-end line of LCD projectors. The \$8,000 (street) **ProScreen 4600 Impact**, designed for road warriors who experience a range of unfavorable lighting conditions, generates 650 ANSI lumens and sports a lamp good for 2,000 hours at maximum

brightness. The \$7,500 **ProScreen 4600 Endurance** is designed for use in educational and training environments, where reliability and low cost of ownership are key. It generates 500 ANSI lumens and has a rated lamp life of 8,000 hours. Both ProScreen units have a native resolution of SXGA (1,280-by-1,024). Each has two receivers for the included infrared remote controls—one on top and one on the front.

New from Proxima Corp. (800-447-7692, www.proxima.com) comes the **Proxima DP5900**, an SVGA-resolution LCD projector that sells for \$8,999. Generating 700 ANSI lumens and weighing 14 pounds, it has a 1.6:1 motorized lens and can display images at a maximum distance of 92 feet. The projector ships with Proxima's new Laser F/X remote control, which is equipped with a laser pointer.



PROJECTING THE RIGHT IMAGE: New entries from Philips, Davis, Lightware, Epson, and InFocus (clockwise from bottom left).

A relatively new player in the U.S. projector market is Davis North America (888-798-9998, www.davisna.com), which is now selling the \$7,995 **Powerbeam VI**. An SVGA-resolution unit, the Powerbeam is based on DLP technology. It generates over 600 ANSI lumens and boasts a lamp life of over 1000 hours and a contrast ratio of 250:1. The unit also includes a pair of 6-watt speakers, a remote control, and a hard-

shell rolling case.

Also look for the new \$9,995 **Lightware L-1020** from Lightware (800-445-9396, www.lightware.com). Rated at 500 ANSI lumens, this unit has a contrast ratio of 150:1.—Josh Levy

RECAP We reviewed five XGA LCD projectors in our issue of November 18, 1997. Our Editors' Choice winner was the Proxima DP9200.

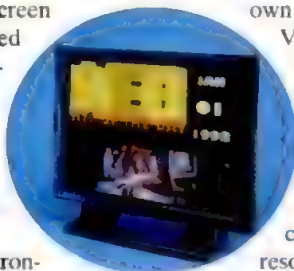
LARGE-SCREEN MONITORS

Images of the Future

New display technologies are popping up all over, and they're starting to revolutionize more than just the individual client desktop. These new large-screen monitors are poised to bring the industry's latest innovations to conference rooms and corporate boardrooms around the world.

Mitsubishi Electronics (800-843-2515, www.mitsubishi-display.com) is pushing the envelope with the release of its \$12,999 **Leonardo** plasma monitor.

Like all plasma monitors, the Leonardo produces light by energizing neon and xenon gases enclosed in tiny chambers in a sealed glass envelope.



PLASMA DISPLAYS: Mitsubishi's Leonardo monitor.

The Leonardo can be used as a standard large-screen display or as an interactive touch panel.

It incorporates Mitsubishi's own Distortion-Free Video technology, which is built to enhance fast-motion scenes. Though the resolution is fixed at 640-by-480, the Leonardo can display higher resolutions using a digital signal processing technique that re-adjusts the pixel count. The monitor has a 40-inch (diagonal) viewable area but is just 4 inches deep and weighs only 66 pounds, making it suitable for wall mounting.

From Davis North America (888-798-9998, www.davisna.com)

is the **Powerscreen** rear-projection monitor (\$15,000 street), which uses Texas Instruments' Digital Light Processing (DLP) technology. The Powerscreen has a viewable area of 60 inches, is just over 25 inches thick, and weighs 211 pounds. It has Picture-In-Picture television capability and can support an optional Ethernet card for network connections via third-party dealers. The unit comes with a remote control, and the infrared interface can also support wireless keyboards.

The market in large-screen monitors also includes a few new rear-projection LCD screens. These include the 37-inch, \$7,200 **Sony KL-W7000** and the 50-inch, \$9,000 **Sony KL-W9000**, from Sony Electronics (800-476-6972, www.sony.com/newdisplays). Also look for Mitsubishi's 50-inch **MegaView 50** and 27-inch **MegaView Pro 27**. These come with wireless remote controls and retail for \$17,995 and \$4,999 list, respectively.—Jennifer Anderson

JAVA

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All of the fuss and excitement surrounding Java has generated a demand for it by both programmers and non-programmers. Novices will find the following interactivity creation tools easy to use, and old hands will appreciate the time they save on coding.

Accurate HTML conversion of word processing or spreadsheet files normally requires technical expertise beyond most end-users' capabilities. Interleaf's \$149

Xtreme Personal Edition (800-955-5323, www.interleaf.com)—an



CHARMED I'M SURE: Customize your applet via a dialog box.

entry-level version of Xtreme Web-publishing—lets you "Web-enable" documents created in Microsoft Office, Lotus SmartSuite, and other software packages by simply using a wizard that makes it easy to create a richly formatted

document or spreadsheet that's viewable on the Web without using any Java programming. The documents can then be inserted

into a Web page and accessed in a Java viewer with any Java-enabled browser.

Because the Java viewer doesn't strip out formatting the way HTML conversion does, users view documents as they were intended to be viewed.

The new \$139.95 version of Mainstay's **PageCharmer** (805-484-9400, www.mstay.com)—a set of nine customizable Java applets—lets you add scrolling marquees, tickers, buttons, and image maps to your site without coding. The small size of the applets (46K for all nine) assures relatively quick download times.

PageCharmer's applets work like templates—you set the text and preferences for each in a dialog box. Extended navigational capabilities include tab states and pop-up menu lists. The included Applet Set'r utility lets you view changes made to the applet properties in real time

using any Java-capable browser. The dialog box is displayed on top of the browser window, so you can view changes and settings at the same time.

Emblaze HotSpots, a \$99.95 Internet Web-page enhancement tool from GEO Publishing (800-576-7751, www.emblaze.com), enables multimedia interaction and navigation on a Web site. You can mark up to 50 areas on any GIF or JPEG image and have each selected area be assigned to as many events as you choose. These events can include sounds, links to other sites, roll-ins, roll-outs, and more—all assigned without programming.

HotSpots works with such popular HTML editors as Adobe Page Mill and Microsoft FrontPage, and the included Time Monitor will detect the modem speed of visitors to your site and adjust the performance accordingly.—Doug Beizer

WEB VIDEO

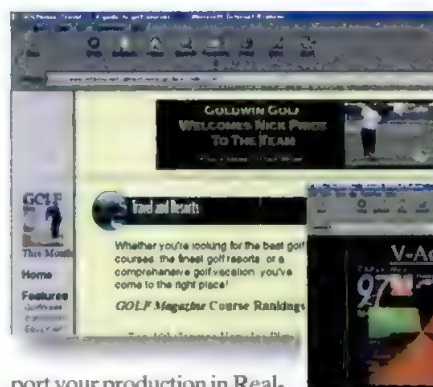
Lights, Camera, Click Here

When done right, video elements on a Web page can have a dramatic effect, but the implementation may be daunting. The following products smooth the process of integrating your video.

Ephyx Technologies' **V-Active for RealVideo, Version 2.0** (888-463-7499, www.ephyx.com), can embed time-based events and interactive hotspots into digital video. Using V-Active (available

for download at Ephyx's site for \$295), you can integrate time-triggered events, such as launching URL flips or displaying information (such as author, title, or copyright) at specified frames into any audio/video interleave or QuickTime video file.

You can also create clickable, object-based hotspots that launch URLs, other frames in the video, or other RealMedia files and ex-



VIDEO ACCENTS: V-Active for RealVideo and V-Banner allow you to add video highlights to your Web site.



port your production in RealMedia format for streaming over the RealVideo platform.

The final hypervideo production lets you access multiple layers of information simultaneously, such as viewing additional information about a movie and its production while a movie clip is streamed for viewing.

If a standard Internet banner isn't attracting the amount of attention you would like, you might consider using Intervu's **V-Banner** (619-

350-1600, www.intervu.net) to enhance it with video. V-Banner, which costs \$6 to \$10 per 1,000 impressions, places a video window in your ad banner that can be rotated, delivered from an ad server, and demographically counted.

The 3- to 5-second looping video clips are offered to virtually all Internet users via the Intervu Network, which bypasses some Internet congestion. Intervu's All Eyes system automatically detects the viewer's default video player and plays the V-Banner in the corresponding format.—DB

You Have Mail!

If you get annoyed by the hassle of logging into your Internet provider and opening up your e-mail program only to find out that you have no new mail, Rooster Limited's **Rooster** (972-3562-7540, www.rooster.co.il) real-time notification service may be for you. A real-time e-mail notification service and hardware device that tracks new mail even if your computer and modem are off-line or you're not connected to the Internet, Rooster works through existing phone lines without interruption to regular calls, fax machines, or modems. Notification is sent via the Rooster Service Center (which must be connected to your ISP) and received by the hardware device, which plugs into the phone jack and a power outlet. The Rooster hardware device has a one-time purchase price of \$20, and the notification service costs \$4 per month.—Emily Cohen



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Source: WPC, Inc., Winstone Laboratories. Configuration: 486SX motherboard and 256 MB of memory; Single Barracuda SCSI hard disk drive with Adaptec SCSI controller card; Riva 286/333 3D PCI graphics card with 4MB RAM; 32MB EDO RAM; 512K pipeline burst cache. All systems tested using identical configurations with one exception: the Pentium II 233 MHz processor was tested with an Intel P044FX motherboard and T100 440FX chipset. *Source: Cyrix Corporation.
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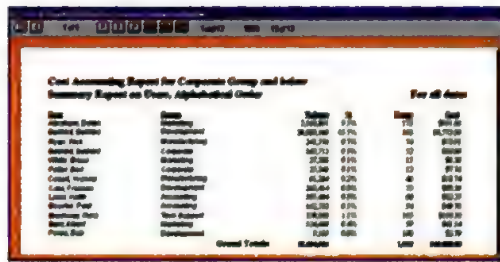
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NETWORK MANAGEMENT

Budgeting the Bandwidth

It is an IS manager's least favorite task: convincing the front-office bean counters that the company needs another T1 connection to the Internet, then showing them which cost centers should be billed for hardware and services. But help is on the way. Both Cisco Systems (800-553-6387, www.cisco.com) and SeQuel Technologies (800-973-7835, www.sequeltech.com) have IP network usage-report products that you can use to determine the appropriate



BANDWIDTH MANAGER: *Sequel Net Access Manager 3.0.*

departmental charge.

The \$9,995 IOS-based **Cisco Enterprise Accounting for NetFlow 2.0** works with Cisco's 7000, 7200, and 7500 family of routers and

the RSM module for the Catalyst 5000/5500. Each Cisco software-based NetFlow Flow-Collector gathers traffic and usage data from up to 15 routers.

The solution's Cisco Enterprise Accounting (CEA) function, in turn, can analyze data from as many as 100 FlowCollectors.

That data can then be used to generate reports—in text or HTML format—on network usage, application usage, users, and departmental roll-ups. Users can also export collected data to a SQL or ODBC database for later analysis.

Though similar to CEA, the

\$3,995 Sequel Net AccessManager 3.0 goes beyond reporting network usage on an individual and departmental level by also allowing you to define user and departmental access to the TCP/IP network. AccessManager does not monitor TCP/IP traffic based on host names or simple IP address. Instead, the product tracks traffic by user log-on names. It can monitor users who are remotely connected over various machines.

The usage data gathered by SeSeQuel can be stored for later analysis in MS SQL Server 6.5, Oracle Server 7.3, or ODBC 2.0. The user can choose from 48 HTML- and text-based usage and administrative reports.

—Robert Daly

WIRELESS LANS

Up to Spec

The IEEE 802.11 standard for wireless LAN conformance has been approved for a little over six months (though not yet ratified). At least three popular wireless LAN vendors already have products that comply with the standard.

The standard opens two new radio-frequency transmissions—2.4-GHz frequency hopping and 2.4-GHz direct sequencing—and it addresses the important issue of interoperability among different wireless LAN vendors.

Currently, Aironet Wireless Communication (800-247-6638, www.aironet.com), Breezecom Wireless Communications (760-431-9880, www.breezecom.com), and Raytheon Wireless Solutions (508-470-9011, www.raylink.com) have products that conform to IEEE 802.11. The three vendors are awaiting ratification of the standard before issuing free firmware upgrades.

Aironet Wireless Communications recently released the 3500 Series, which consists of the \$595 **PC3500 PC Card Wireless LAN Adapter** and the **AP3500 Access Point** (\$1,795 for Ethernet and \$2,395 for Token-Ring). The

PC3500 is a Type II PCMCIA card with a snap-on antenna that can support throughput speeds of 1 Mbps or 2 Mbps. The adapter also provides a smart scanning function that balances loads between various access points as well as a sleeper function that enables a PC to maintain a network connection while consuming a low level of current.

The AP3500 Access Point comes in Ethernet and Token-Ring versions. An administrator can manage it directly from a terminal connection or remotely via a telnet connection, FTP session, SNMP application, Web browser, or Window-based utility.



LINKUP: Raytheon's Raylink of wireless products conform to the 802.11 draft.

Breezecom's answer to the new IEEE 802.11 standard is the Pro Series of wireless products, which include the \$565 **SA-PC Pro** PCMCIA adapter and the \$1,495 **AP-10 PRO** Ethernet access point.

The AP-10 Pro is a mouse-size computer device with four front-panel LEDs that display the unit's power status, wired LAN activity, wireless signal quality, and wireless synchronization. The access point comes with a 10Base-T physical interface and can support throughput of 1 Mbps, 2 Mbps, or 3 Mbps. The unit is configured through a dumb terminal connection.

A leader in frequency-hopping radio technology, Raytheon Wireless solutions checks into the IEEE 802.11 arena with its Raylink family of products. Together, the \$1,495 **Raylink Access Point** and the \$550 **Raylink PC Card** provide in-building coverage of 500 feet.

The Raylink PC Card features drivers for Windows 95, Windows NT, Windows for Workgroups, and NetWare. The card has a rotating diversity antenna and a data transfer rate of 2 Mbps.

The Raylink Access Point is a wall- or desktop-mountable unit that can employ a Raylink PC Card or a variety of antennas. The access point comes with a built-in 10Base-T connection and offers 2-Mbps data throughput.—RD

An Electrifying Concept

For a long time now, industry visionaries have predicted that one day your home PC would not only be connected to the Internet but wired to the more mundane (like a toaster or light switch). Thanks to products from such companies as Intelogis (888-756-5199, www.intelogis.com), you can now run network traffic over your home's electrical wiring.

Currently available for PCs running Microsoft Window 3.x and Microsoft Windows 95, **The Passport** plugs directly into an electrical outlet and then connects to the parallel port on your PC or printer. Using a proprietary modulation technique, Passport units can achieve a throughput of 350 Kbps. Intelogis claims that future versions of The Passport will be able to accommodate transmission speeds of up to 1.5 Mbps. —RD



ALIVE WIRE: Intelogis's *The Passport*.

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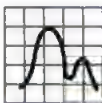
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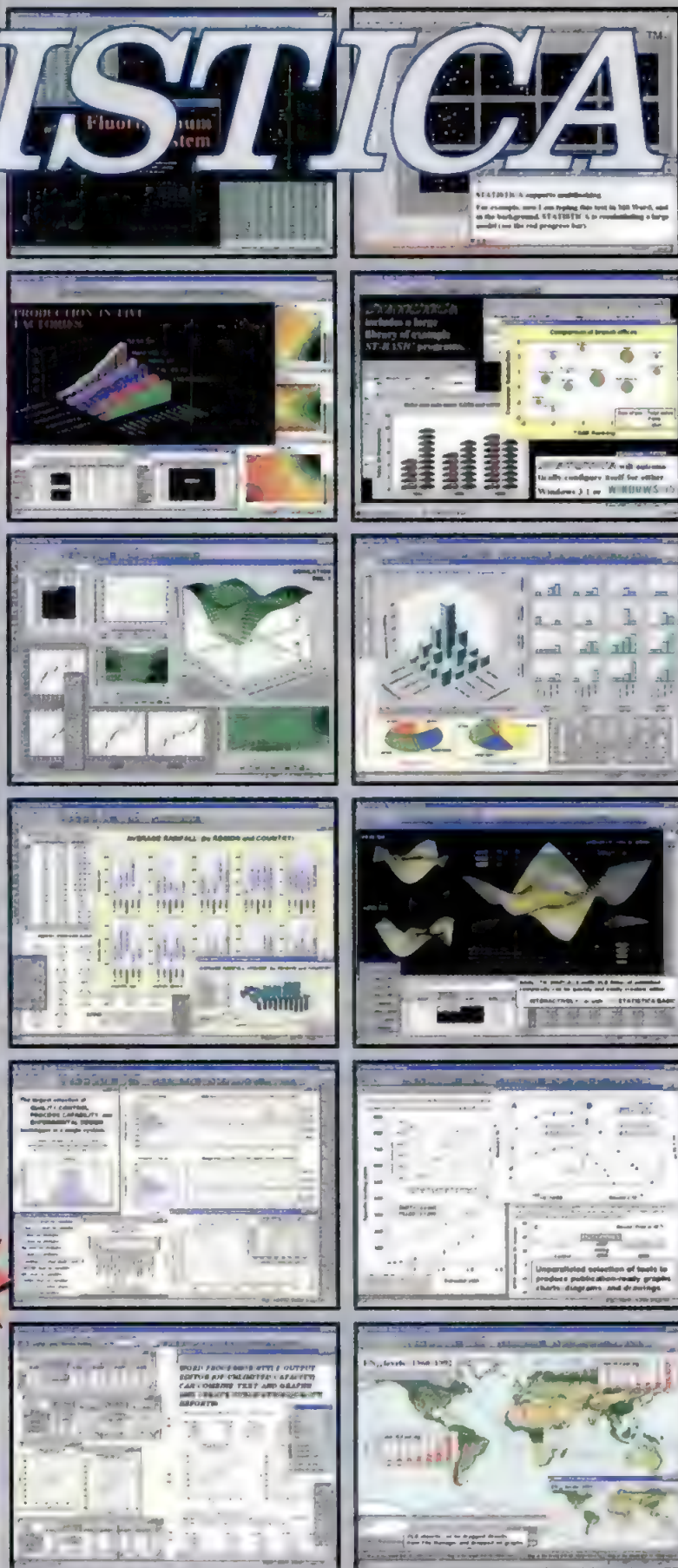
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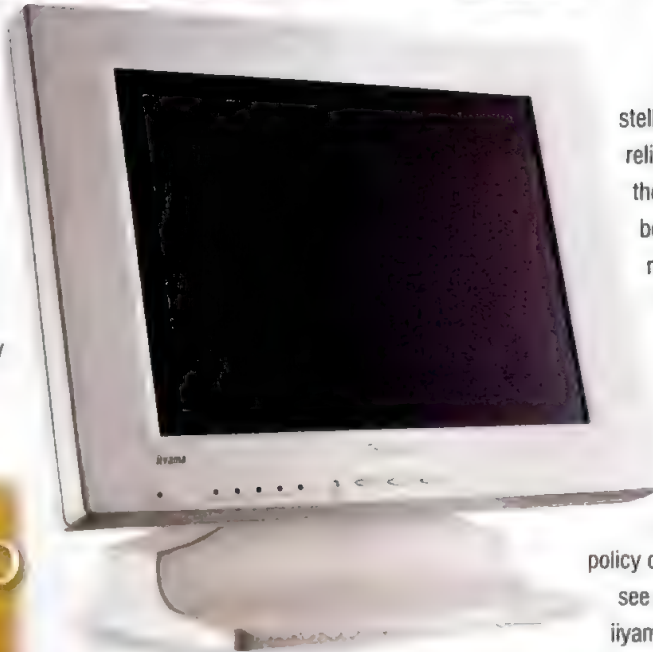
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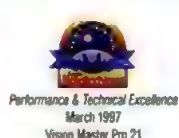
	Iiyama ProLite 36	ViewSonic ViewPanel VP140	NEC LCD480V	Sanyo FT155	CTX PanelView 530
Screen Size/Type	14.1" TFT	14.0" TFT	14.1" TFT	14.5" TFT	12.1" TFT
Max. Resolution @ 75Hz	1024 x 768	1024 x 768	1024 x 768	1024 x 768	800 x 600
Maximum number of defective pixels for service or replacement	7, 2 if adjacent	7, 2 if adjacent	Depends on the count and location of the defects.	0	<19 White, 2 if adjacent <16 Dark, 2 if adjacent
Power Supply	Built-in	External	Built-in	External	External
Warranty	3/3/1 years	3/3/1 years	3/3/1 years	3/1/1 years	1/1/1 years
Price (Manufacturer's Estimated Price)	\$1,599	\$2,399	\$1,999	\$2,295	\$2,295



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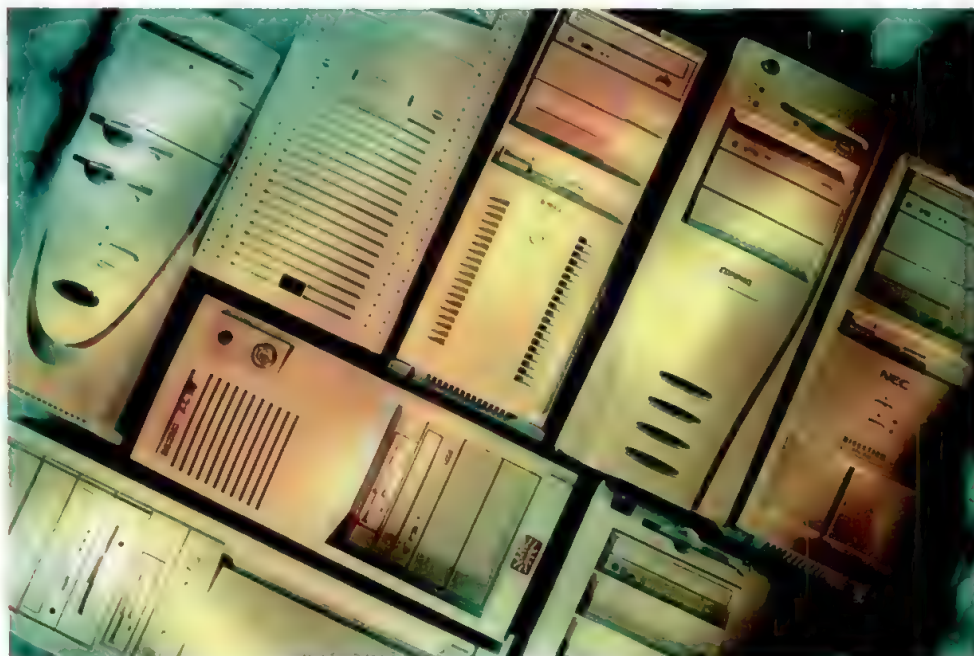


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First Looks



Deschutes Debuts

Intel brings its first 0.25 μ desktop CPU to market. PC Labs tests eight 333-MHz Pentium II PCs running Windows 95 and Windows NT 4.0.

By Cade Metz and
Patrick Norton

Get your good-byes in now: This may be the swan song of Intel's 66-MHz system bus. The first Deschutes processor, a 333-MHz incarnation of the Pentium II announced in January, is likely to be the last new high-powered desktop CPU to use a memory bus any slower than 100 MHz. Manufactured on a 0.25 μ process, the chip has a higher core frequency and a smaller die than its predecessors, but it is still subject to the more than four-year-old bus bottleneck (which should be alleviated with subsequent Deschutes designs later in the year). In the following pages, we review eight inaugural 333-MHz systems: four so-called professional enthusiast PCs with Mi-

crosoft Windows 95 and four managed corporate machines running Windows NT 4.0.

THE PLAYERS

With our four professional enthusiast PCs—from Dell Computer Corp., Gateway 2000, Micron Electronics, and NEC—the concern is for sheer speed and multimedia rather than manageability. Meant for individual or small-office users, these Windows 95 PCs are typically outfitted with AGP graphics adapters, DVD-ROM drives, 64MB RAM, and 8GB hard disks.

Though they are certainly appropriate for standard business applications, their particular strengths are graphics manipulation, high-end video, and modem-based Internet browsing. These PCs are also ex-

tremely affordable, priced from about \$2,900 to \$3,600.

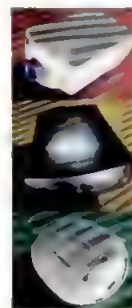
The managed machines—from Compaq Computer Corp., Dell, Hewlett-Packard Co., and NEC Computer Systems Division—are Windows NT boxes designed for environments in which a small group of IT administrators oversees a comparatively large corporate LAN. Ostensibly, they are easily upgraded, repaired, and monitored from a remote console using software based (in large part) on the Desktop Management Interface (DMI).

Priced from about \$3,000 to \$4,200, they are each equipped with 64MB of system memory, a 4.3GB or larger hard disk, a graphics subsystem with at least 4MB of memory, and a CD-ROM drive. All four are also

INSIDE

SEE USB:

Cameras from Intel and Xirlink let you videoconference through your USB port. See page 60.



JUST DREAMY

Macromedia's Dreamweaver lets you create Web pages in Dynamic HTML. See page 64 for the review.

Browser	Target	Errors	Warnings
Microsoft Internet Explorer 2.0	7	0	0
Microsoft Internet Explorer 3.0	0	0	0
Microsoft Internet Explorer 4.0	0	0	0
Netscape Navigator 2.0	2	0	0
Netscape Navigator 3.0	2	0	0
Netscape Navigator 4.0	0	0	0

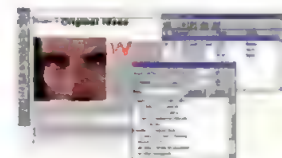
DO IT ALL

Panasonic's KX-PS8000 is more than just a multi-function device. For the review, see page 68.



PERSONAL PUBLISHER:

At long last, QuarkXPress 4.0 hits the desktop publishing market. For the story, see page 73.



More Products Reviewed...

Bigpicture TV Phone	60
WebCast Personal	60
Forecast Pro	76
Java Studio 1.0	76

First Looks

available with 100-Mbps Wake-on-LAN Ethernet adapters.

DESKTOP DESCHUTES

All eight PCs in this roundup benefit from the added performance of Deschutes, the successor to the original Pentium II (code-named Klamath). Named for yet another Oregon river, Deschutes is the first of Intel's desktop processors to use the 0.25 μ manufacturing process introduced last fall with the Mobile Pentium CPU (code-named Tillamook).

With a die that holds many more transistors per square millimeter than the 233-, 266-, and 300-MHz Klamath chips, Deschutes manages a higher clock speed and requires less power. (Intel will soon introduce a Mobile Deschutes processor whose power consumption falls beneath the company's self-imposed 8-watt ceiling.) Otherwise, the new design is identical to the Pentium II. Mounted on a substrate and encased in a single-edge contact (SEC) cartridge, it incorporates the MMX instruction set and interfaces with its 512K secondary cache at half its core clock speed.

Since the debut of the 60-MHz Pentium more than four years ago, all new Intel processors have used either a 60- or 66-

MHz bus—even though CPU clock speeds have increased more than five-fold. The 333-MHz Pentium II may be the fastest x86 processor to date, but it still interfaces with its memory subsystem and various local buses at the same speed as many 486 chips. This isn't to say that the new processor is anemic—compared with 266-MHz Pen-

next incarnation of Deschutes, due to arrive by midyear. This chip, likely to run at speeds of 350 to 400 MHz, will eschew the tired 66-MHz system bus for a long-awaited 100-MHz design (presumably supplied by a new core-logic chip set).

Later in the year, Intel will reportedly introduce Slot 2, a Pentium II interface designed specifically for high-end workstations and servers. Whereas Slot 1—used by all extant Pentium IIs—allows for just two CPUs and supports only the half-speed secondary cache, Slot 2 will provide for four-way multiprocessing and an L2 cache that runs clock-for-clock with the CPU (a la the Pentium Pro).

When dealing with microprocessors and PCs—mobile or desktop—there is always a tendency to look ahead and neglect the status quo. Yet the latest available hardware is always faster than anything to have come before. The 333-MHz systems—15 percent more adept under ZD Winstone 98 than their 266-MHz counterparts in the professional enthusiast genre and 26 percent more adept in the managed PC category—are eminently proficient machines available at the most mainstream of prices. With the

exception of the Compaq Deskpro 6000, which uses a 7,200-rpm SCSI drive, each machine sells for less than \$3,800, monitor included. You can wait a few months for the 100-MHz bus, but you won't be dissatisfied if you buy now.

PROFESSIONAL/ENTHUSIAST PCs

Dell Computer Corp.

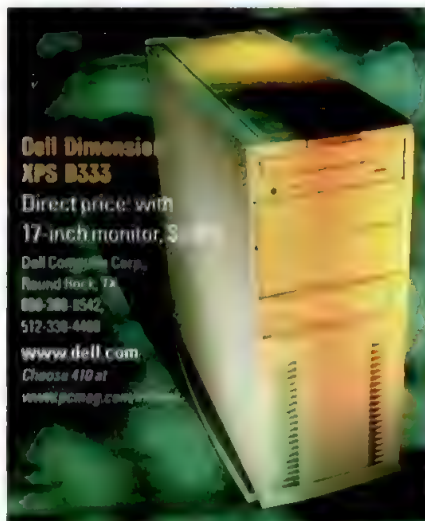
Dimension XPS D333



With an outstanding ZD 3D WinMark score as well as excellent DVD playback, Dell's fully outfitted Dimension XPS D333 (\$2,929 direct) delivers the best value in our group of Windows 95 PCs. And for doing so, this machine earns our Editors' Choice award.

Despite its full complement of cards—an STB Velocity 128 3D AGP graphics card, a Quadrant International Cinemaster II DVD decoder, a Creative Labs AWE64 wavetable sound card, and a US Robotics x2 WinModem—the Dimension still has a pair of PCI slots open for expansion. It also has one open 5.25-inch and a pair of 3.5-inch removable-media bays.

There's also an open internal 3.5-inch bay, but with a 9.1GB Seagate Medalist hard disk, we suspect you won't be needing



tium II models from the same manufacturers (reviewed in "The Best PCs for '97 and '98," December 2, 1997), the 333-MHz machines reviewed here exhibited a 20 percent improvement on our CPUmark test—but it doesn't realize its potential.

WHAT'S AHEAD

A much larger leap in performance should come with the

BENCHMARK TESTS

Windows 95 Pentium II/333 PCs



The results of our benchmark tests for these Windows 95-equipped Pentium II/333 machines showed overall performance, as judged by our Business Winstone 98 test suite, to be fairly similar for all systems. The performance leader—by a slim margin—was the NEC Direction SPL333. This machine came equipped with the

most adept 2-D graphics board in the field: the Number Nine Revolution 3D. Despite its name, the Revolution consistently performed extremely well on our mostly 2-D-intensive Winstone and Graphics WinMark tests. The other systems here used graphics boards with a penchant for 3-D, as evinced by their high 3D WinMark scores.

	ZD Business Winstone 98 Score	ZD Business Graphics WinMark 98 Score	ZD Business Disk WinMark 98 Thousands of bytes/sec	ZD CPUmark₃₂ Score	ZD CD-ROM WinMark 98 Thousands of bytes/sec	ZD 3D WinMark 98 Score
Dell Dimension XPS D333	22.2	126	1,600	801	588	604
Gateway G6-333	24.0	131	1,380	849	777	509
Micron Millennia XKU 333	23.6	128	1,390	825	1,150	516
NEC Direction SPL333	24.7	180	1,560	877	680	720

BETTER ►

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Editors' Choice

- Windows 95: Dell Dimension XPS D333
- Windows NT: HP Vectra VL 7/333



Whether you're a single power user or a corporate buyer looking to outfit clients on your network with a powerful managed PC, Intel's new 333-MHz Pentium II may be

just the processor you're looking for.

Each of the machines in this dual roundup of Pentium II/333s—whether loaded with Windows 95 for the professional/enthusiast or Windows NT for the corporate user—was impressive in its own right. However, two stood above the crowd, offering an incredible amount of bang for the buck.

On the Windows 95 side, our Editors' Choice is the \$2,929 Dell Dimension XPS D333. This system ably lives up to the reputation established by its predecessors: Its performance on our benchmark tests was exceptional, and it offers tons of hardware for a bargain price. In this package, you'll find a 7,200-rpm, 9.1GB EIDE hard disk, a second-

generation DVD-ROM drive, and USB-controlled speakers, among many other features. Dell also received a grade of A on our most recent Service and Reliability Survey.

In the corporate category, our NT-outfitted Editors' Choice is the \$3,030 Hewlett-Packard Vectra VL 7/333. The Vectra met with some stiff competition in this category, but it pulled ahead of the pack in part because of its class-leading management software, HP TopTools. With this package, plus a Wake-On-LAN-enabled network card, the Vectra is the easiest system here to manage from afar right out of the box. The Vectra is also an incredible bargain: It matched every machine here feature-for-feature but beat them all on price by several hundred dollars.

additional storage space for some time. You probably won't find a faster EIDE drive anytime soon, either. The 9140 spins at a whopping 7,200 rpm, the first EIDE drive to do so.

The Dimension did an excellent job on DVD playback with our test movie. With a minimum of highly distracting motion artifacts, it clearly outperformed other DVD systems here. The Dimension used a pass-through cable to the graphics accelerator to hook up the DVD decoder. And the 17-inch Dell Trinitron monitor delivers an especially bright screen and wonderfully crisp graphics.

The Dimension is the only system in this roundup that used its USB ports right out of the box, linking the Altec Lansing Multimedia ACS 495 USB speakers to software controls on the system. Music played back on the ACS 495 speakers had a slight back-

ground hiss and did not deliver the same clarity in the highest frequencies as the Cambridge SoundWorks speaker system that came with the Micron Millennia XKU. They did, however, do an excellent job with the dialog and soundtrack on our DVD movie.

The Dimension XPS D333 did yield the lowest Winstone 98 score in our group of Windows 95 machines, but only by an unnoticeable couple of points. Gamers should note that the Dell delivered an outstanding ZD 3D WinMark score, only a few points behind the Gateway G6-333 (which used the same graphics card).

Though the Dimension does not ship with any DVD titles, it does come with Microsoft Home Essentials 98, which includes Works, Refer-

ence, Greetings Workshop, and Money, among others. The Dimension delivers leading-edge multimedia performance at a great price. If you're on the lookout for a system that will



handle it all with aplomb right out of the box, consider the Dell Dimension XPS D333. —Patrick Norton

Gateway 2000 Inc.

Gateway G6-333

The only full-tower configuration in this roundup of Windows 95 PCs, Gateway 2000's G6-333 takes up a bit more space than the competition. In fact, with its 19-inch monitor and a price of \$3,477 (direct), this machine is pretty big all around. The Gateway G6-333 isn't just taking up space, though. Its full complement of PCI cards delivers awesome multimedia capabilities and offers a ton of room for internal drive expansion.

The Gateway leaves you a bit tight if you're looking to add another expansion card, though. Our test system had a single PCI/ISA slot open. The rest of the slots were filled with a trio of STB cards: an STB Velocity 128 3D AGP graphics card, the Mpack-powered PCI DVD decoder card, and a PCI TV card with two RF-outs, an S-Video connector, and a composite-out. There's also an Ensoniq AudioPCI card and a Telepath for Windows x2 modem.

With a Toshiba SD-M1002 DVD-ROM drive in one 5.25-inch bay and a 100MB Iomega Zip drive in another, the Gateway still offers a pair of open 5.25-inch bays. The IBM DHEA-38451 8.4GB hard disk took one drive bay, leaving six open internal 3.25-inch bays. The Gateway is also the only system in this group with two open DIMM slots.

The G6-333 did an excellent job with DVD movie playback, even with the most high-action scenes. In addition, the Mpack media processor on the STB DVD decoder gives it a number of on-the-fly controls for the MPEG-2 video stream, such as color and brightness. Our test machine came equipped with a first-generation DVD drive, although by the time you read this, Gateway will be shipping

Direct price:
with 19-inch
monitor, \$3,477

Gateway 2000 Inc.,
M. Sioux City, SD
5046-2000,
800-232-3000

www.gateway.com
Choose #17 at
pcmag.com/infoLink

First Looks

the G6-333 with a second-generation DVD-ROM drive.

The unit's Boston Acoustics MediaTheater speakers did an excellent job with soundtracks and game effects, thanks to a huge subwoofer. Though there is an output jack for surround speakers, no surround speakers came with the bundle. (This speaker set doesn't perform Dolby Digital decoding for DVD disks, either.)

The Gateway G6-333 keyboard stood out even before we booted the machine. It has a convenient set of control buttons for audio CD playback, volume, and mute as well as launch buttons for messages, phone, TV, radio, and sleep. The buttons are linked to an on-screen display, so when you hit a control key, there's visual feedback on the monitor. You can also reassign the launch buttons to boot up different applications if you so choose.

The Gateway system led the pack on our 3D WinMark and

CPUmark₃₂ tests by a few points, and it delivered a slightly better-than-average Winstone score. Its Graphics WinMark and Disk WinMark scores trailed the best of the group.

The Gateway G6-333 was the only system to include DVD software: a Hollywood Studios DVD Sampler and a coupon that you can exchange for a DVD movie title. Also bundled is McAfee VirusScan, Microsoft Home Essentials 98, Microsoft

in this group, it's also the best outfitted. Add in the three-year warranty on parts and labor with a year of on-site service and you have a system that's ready to take on any task.—PN

Micron Electronics Inc.

Micron Millennium XKU 333

The most expensive Windows 95 machine in our group also happens to be the only one without a DVD drive. That isn't to say, however, that Micron's Millennium XKU 333 (\$3,599 direct) is without its merits: The bundled 19-inch Hitachi monitor and Cambridge SoundWorks MicroWorks speakers were the best the machines in this roundup had to offer. The Millennium also did an excellent job on our benchmark tests, though we did have to load a fresh driver to bring its 3-D performance up to snuff.

The Diamond Viper V330 Turbo AGP card did an excellent job on our Business Graphics WinMark 98 test. And though its 8.4GB IBM hard disk trailed the fastest drives in our roundup, the Millennium posted the second-highest score on Winstone 98.

With the Millenniuma XKU's AWE64 sound card and a US Robotics Sportster 56-Kbps fax modem, there are still three PCI slots open for expansion—the most room for card expansion in any of the Windows 95 systems. There's also one open internal 3.5-inch bay and one open internal 5.25-inch bay. The trayless/caddyless 32X Pioneer CD-ROM drive mechanically slurps up your CD, and it too posted the highest CD-ROM WinMark score of the bunch. An Iomega Zip drive is also included.

The Cambridge SoundWorks MicroWorks Speaker System set the standard for audio performance in this roundup. The speakers played exceptional bass and exceedingly crisp and detailed highs, no matter what we pumped through them. The Hitachi CM751U monitor generated the better image of the two 19-inch monitors in this group.

The Millenniuma XKU ships with software that leans more toward the home office than the recreation room: Microsoft Office 97 Small Business Edition and Streets Plus. Although the Micron has a five-year warranty, the warranty covers only the processor and system memory—the rest of the system is covered for three years on parts and one year on labor.

Although the speakers and monitor are excellent, the Millenniuma XKU's software bundle and lack of a DVD drive leans toward the small office. And even though it's an attractive machine, the Millenniuma is comparatively costly.—PN

*NEC Computer Systems
Division*

NEC Direction SPL333

The latest system from NEC's direct-sales division, the Direction SPL333 (\$2,975 direct), offered the best Business Winstone 98 performance of the group but lagged behind the



Professional Resource Suite, and MegaPhone telephony software.

Although the Gateway G6-333 is one of the pricier systems

SUMMARY OF FEATURES

Windows 95 Pentium II/333 PCs

	Dell Dimension XPS D333	Gateway G6-333	Micron Millenniuma XKU 333	NEC Direction SPL333
Price of tested configuration (monitor size)	\$2,929 direct (17-inch)	\$3,477 direct (19-inch)	\$3,599 direct (19-inch)	\$2,975 direct (17-inch)
Graphics adapter (interface)	STB Velocity 128 3D (AGP)	STB Velocity 128 3D (AGP)	Diamond Viper V330 (AGP)	Number Nine Revolution 3D (AGP)
Memory	4MB SGRAM	4MB SGRAM	4MB SGRAM	4MB WRAM
Hard disk	Seagate Medalist ST39140A	IBM DHEA-38451	IBM DHEA-38451	Seagate Medalist ST39140A
Capacity and interface	9.1GB Ultra ATA	8.4GB Ultra ATA	8.4GB Ultra ATA	9.1GB Ultra ATA
CD-ROM or DVD drive	Hitachi GD-2000	Toshiba SD-M1002	Pioneer DR-501S	Hitachi GD-2000
CD-ROM/DVD speeds	12X-20X / 2X	8X-12X / 1X	14X-32X / N/A	12X-20X / 2X
Installed modem	U.S. Robotics x2 WinModem	Gateway Telepath with x2 technology	U.S. Robotics 56K (x2)	U.S. Robotics 56K (x2)
Warranty (parts/labor)	3 years/1 year	3 years/3 years	CPU and RAM, 5 years, other parts, 3 years/1 year	3 years/3 years
Included on-site service	1 year	1 year	1 year	1 year

N/A—Not applicable. This product is not equipped with a DVD drive.



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experts think so, too.





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XtE 166
Aug. '97



Powerdigm
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Millennia
XtE 300
Sept. '97



Millennia
Pro2 200
Sept. '97



Millennia
Pro2 200
Sept. '97



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XtE
Oct. '97

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* *Computer Shopper*, Sept. 1997

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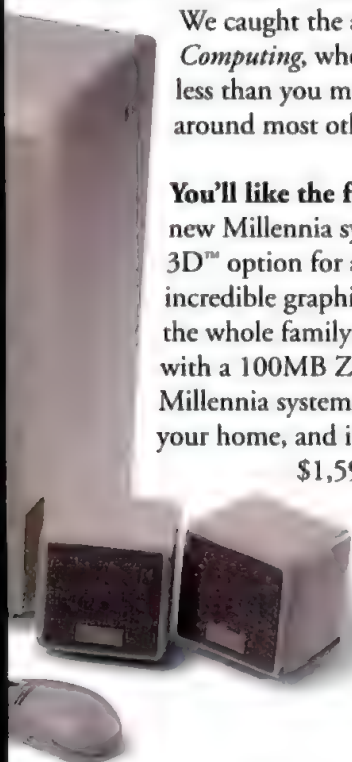
Work hard, play hard. Get the job done faster and have more fun with help from the Micron™ Millennia® family. Earning more than 55 awards and recommendations in 1997 alone, the Millennia desktop offers unbeatable performance, power and multimedia applications for your entire family!

A force to be reckoned with. The incomparable Millennia XKU is "a standout performer," according to *PC Magazine* editors. And we like standing out. Our award-winning Millennia XKU features the latest in the Intel Pentium® II processor and chip set technology, along with an accelerated graphics port. That means more memory and power for your most demanding applications.

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You'll like the fringe benefits. We custom build your new Millennia system to your exact needs. Add the Fusion 3D™ option for awesome DVD technology, a super sound card, incredible graphics and more. Get multimedia sights and sounds that blow the whole family away! And remember, all Millennia models come standard with a 100MB Zip drive for virtually unlimited storage. When you buy certain Millennia systems, you'll get a software bundle of your choice for everyone in your home, and it's included with your purchase. Millennia systems start at \$1,599, so you won't compromise power or price. Call Micron today — we'll make you feel right at home!



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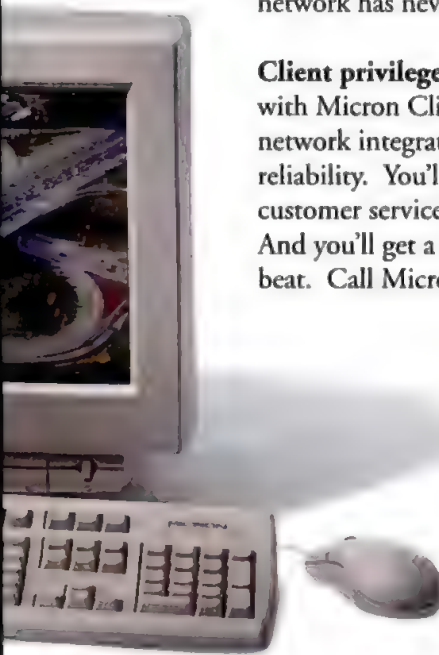


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The logical choice. With more than 400MB per second throughput, rendering drawings and CAD applications is faster than ever. Business finance or high-end applications are incredible, too. With Micron's own Samurai core logic, the Powerdigm workstation delivers 64-bit 66MHz PCI bus, in a system based on Intel architecture and supports dual monitors.

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Intel 233MHz Pentium® II processor
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NOS Support (3 incident resolutions/1st year), 7x24

STANDARD FEATURES

Single or dual Intel Pentium II processors
512KB integrated cache in SEC package
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Integrated Adaptec PCI Ultra Wide SCSI-3 controller
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Single or dual Intel Pentium II processors
512KB integrated cache in SEC package
Memory: ECC EDO or SDRAM option
9 expansion slots: 6 PCI, 2 ISA, 1 shared ISA/PCI
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Intel 166MHz Pentium processor with MMX™ technology
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S3 ViRGE graphics accelerator
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Flash Bios
Network Adapter with Wake On LAN technology
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S3 ViRGE graphics accelerator, 2MB EDO RAM
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Chassis intrusion alert
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Network Adapter with Wake-On-LAN Technology
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Microsoft Windows NT Workstation
Intel LANDesk Client Manager
Advanced Hardware Monitoring and Power
Management features
Chassis Intrusion Alert
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2 Modular expansion bays
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Microsoft® Windows® 95 and MS® Plus!
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5-year/1-year Micron limited warranty

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Intel 166MHz Pentium processor with MMX technology
24MB EDO RAM (40MB max.)
2.1GB hard drive
16X modular CD-ROM drive
Li-Ion battery
3Com US Robotics 56Kbps modem
12.1" TFT SVGA, 800x600 display
256KB L2 pipeline burst cache
PCI bus with 128-bit graphics accelerator
MPEG compatible
Zoomed video-ready
Touchpad pointing device
Microphone and 16-bit stereo sound
2-way infrared port
Modular floppy drive
Microsoft Windows 95 and MS Plus!
5-year/1-year Micron limited warranty

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Intel 200MHz Pentium® processor
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32MB EDO RAM
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Micron TransPort XKE 200

Intel 200MHz Pentium processor
with MMX technology
64MB EDO RAM
3.0GB removable hard drive
13.3" TFT XGA display

\$4,099

Bus. Lease \$130/mo.

TransPort Options

VLX Options: Motorola Montana 33.6 fax/modem, Dragon Systems NaturallySpeaking Personal voice recognition software, 3Com PCMCIA ethernet adapter, 10-base-T, Custom nylon carrying case, Samsonite leather carrying case, 2nd Li-Ion battery, 2.1GB primary hard drive upgrade, 8MB EDO RAM upgrade (24MB total), 24MB EDO RAM upgrade (40MB total)

XKE Options: Microsoft Windows NT 4.0, MicronDock™ multimedia port replicator with hot docking and built-in battery charger, Micron Executive™ desktop package: Matching black monitor, mouse and keyboard, PCMCIA ethernet adapter, 10/100 base-T, Leather carrying case upgrade, 2nd modular lithium-ion battery, Primary and secondary modular HDD upgrade options up to 5GB, Memory upgrade options up to 192MB, Auto/Air adapter, Multimedia Xcitement Pak

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Microsoft® IntelliMouse™, USB Connections
Microsoft Windows® 95 and MS® Plus!
Microsoft Office 97 Small Business Edition
Choice of one Micron Software Solutions Pak
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Intel 166MHz Pentium® processor
with MMX™ technology
32MB SDRAM
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15" Micron 500FGx, .28dp
(13.7" display)

\$1,599

Bus. Lease \$55/mo.

Millennia MME 200

Intel 200MHz Pentium processor
with MMX technology
64MB SDRAM
4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$1,999

Bus. Lease \$70/mo.

Millennia MME 233

Intel 233MHz Pentium processor
with MMX technology
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,199

Bus. Lease \$77/mo.

Micron Software Solutions Paks

Quicken Financial Suite '98: Quicken Deluxe, Parent's Guide to Money, Quicken Financial Planner, Quicken Family Lawyer†

Home Productivity Pak: Compton's Interactive Encyclopedia, Broderbund's Print Shop Ensemble III, Crayola's Magic 3D Coloring Book, Mindscape's Mavis Beacon Teaches Typing, Creative Multimedia's, The Family Doctor, Net Nanny†

EdVenture Pak: Creatures by Mindscape, Freddi Fish 2 by Humongous Entertainment, Schoolhouse Rock by Creative Wonders, Reader Rabbit: Kindergarten by The Learning Company, Dr. Seuss Green Eggs and Ham by Broderbund†

Arcade Pak: X-wing vs. Tie Fighter, Need For Speed 2, Command and Conquer Red Alert, 4 button game pad†

Millennia XKU

STANDARD FEATURES

82440LX chip set
512KB internal L2 cache, 2MB BIOS
Integrated 100MB Iomega Zip drive, 3.5" floppy drive
32X EIDE variable speed CD-ROM drive
32 voice wavetable stereo sound,
Advent 009 speakers with subwoofer
3Com/US Robotics 56K x2 data/fax modem*
Diamond Viper V330 128-bit 3D video
with 4MB SGRAM
Microsoft IntelliMouse, USB connections
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3-year Micron Power limited warranty

Millennia XKU 266

Intel 266MHz Pentium II processor
(features MMX technology)
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,499

Bus. Lease \$87/mo.

Millennia XKU 300

Intel 300MHz Pentium II processor
(features MMX technology)
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,699

Bus. Lease \$92/mo.

Fusion 3D Option Pak

DVD-ROM, ** DVD software
E4 Cool DVD PCI decoder card: 6 channel AC-3 to 2 channel out capability, SPDIF output (digital audio out), AWE 64 ISA sound card
Cambridge SoundWorks/MicroWorks - 2 speaker satellite with subwoofer stereo system
Monster 3D graphics card with 4MB memory***
Fusion 3D game pak: Mech Warrior 2: Mercenaries D3D version, AH-64D Longbow, U.S. Navy Fighters '97, Command & Conquer, Formula 1 D3D version
MS Sidewinder Pro Joystick

XKU Add **\$449**
MME Add **\$599**

*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potential.

**The CD-ROM drive will be removed upon the purchase of the DVD upgrade.

***Available only on Millennia MME system.

Available only on Millennia systems with Microsoft Windows 95.

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Iomega 1GB Jaz SCSI drive
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Microsoft SideWinder™ 3D Pro joystick	\$59
AWE 64 ISA sound card	\$75

Storage/Media Options

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Plextor 12/20 Plex 3MB/sec SCSI internal CD-ROM drive	\$100
Upgrade from system with standard EIDE CD-ROM drive	
Iomega Jaz SCSI drive with 1GB removable cartridge	\$299
Iomega Zip IDE drive with 100MB removable cartridge	\$99
Iomega 6-pack of 100MB Zip cartridges	\$99
Sony 4/8GB SCSI DDS-2 tape backup drive with tape and software	\$899
Seagate TR-4 4/8GB IDE tape backup w/software	\$239
Seagate TR-4 4/8GB SCSI tape backup w/software	\$279

Display/Video Options

19" Hitachi SuperScan CM751 (18" display) .26dp color monitor*	\$300
21" Hitachi SuperScan CM801 (20.0" display) .26dp color monitor*	\$650
Number Nine Revolution 8MB video card	\$249

Software Options

Small Business Essentials: QuickBooks, Visio, Norton AntiVirus, Astound, Focal Point, American Yellow Pages	\$179
CorelDRAW 7 (full retail version)	\$299
Corel WebMaster Suite (full retail version)	\$99

Printer Options

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HP DeskJet 890Cxi	\$429
HP LaserJet 6Lxi	\$399
Lexmark 1000 Color Jetprinter	\$140
Lexmark 2030 Color Jetprinter	\$179
Lexmark 7200 Color Jetprinter	\$399
Lexmark Optra E+ Laser printer	\$399
Epson Stylus Color 600	\$269
Epson Stylus Color 800	\$399
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Other service options may be available, ask your system consultant	

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3Com 3C905 EtherlinkXL PCI combo network adapter	\$99
3Com OfficeConnect Hub 8/TCP	\$149
3Com OfficeConnect Switch 140	\$969

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APC Pro7T surge suppressor	\$59
Microsoft Natural Keyboard upgrade from standard keyboard	\$49

* Requires SCSI bus adapter
* Upgrade from system with standard Micron 17" 17"Ga color monitor
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* 2nd year and 2nd and 3rd year offerings are available in the United States only. Extended services, if purchased after system shipment, may have a higher cost.
* Service will be scheduled whenever possible, for the next business day after parts are received by the customer.
* Available in certain locations, ask your system consultant for details.
Some options and accessories available with system purchase only.

* Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.



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other systems in DVD and audio performance. NEC targets this system to the small office that demands leading-edge technology.

Most of peripherals NEC loaded into the SPL333 favor straightforward business applications. The Number Nine Revolution 3D AGP graphics accelerator, for example, delivered the best Business Graphics WinMark score by 20 percentage points. Its 3D WinMark performance, however, was far behind its competitors. Buoyed by its graphics performance and helped along by its 7,200-rpm Seagate Medalist EIDE drive, the NEC topped the group on our Business Winstone test.

The Hitachi GD-2000 DVD drive and Quadrant International Cinemaster II MPEG card had no trouble playing our test DVD but displayed the worst image quality of the three DVD systems in our group. DVD playback was plagued with motion artifacts, and the mouse would jump from place to place on the screen when playing back DVDs in full-screen mode—a sign that the DVD playback was eating most of the available clock cycles in the system.

The 17-inch NEC monitor did a respectable job, though it didn't stand out compared with the others in this group. The Altec Lansing satellite speakers will more than handle games, music, and audio from DVD music, but they didn't handle low bass tones as well as the speakers bundled with the Micron and Gateway systems.

Since the Yamaha OPL3-Sax chip that provides audio and soft-wavetable MIDI support for the NEC is on the motherboard, the unit is left with two open PCI and one ISA slot. The system also has an available 5.25-inch bay and two open 3.5-

inch bays on the front of the machine and a single internal 3.5-inch bay.

The Direction SPL333 has the most extensive bundle of



software in this group. Although it didn't come with any DVDs, it did include a comprehensive bundle of Microsoft software titles: Office 97 Small Business Edition, Precision Racing Indy Car Sim, Flight Sim 98, and Streets 98.

If you're looking for an extensive selection of software, good support, and excellent business performance, consider NEC's Direction SPL333.—PN

CORPORATE MANAGED PCs

Compaq Computer Corp.

Compaq Deskpro 6000 Model 6333X/4300/CDS

Using an UltraSCSI hard disk, the 333-MHz Deskpro 6000 Model 6333X/4300/CDS—the high end of Compaq's corporate PC line—is one of this round-up's fastest machines, but at \$4,200 (street) it is also the most expensive Windows NT system. Were the system equipped with an IDE hard disk (like almost 80 percent of the Deskpro 6000 line), it would more closely resemble the managed PCs reviewed below in both speed and price. In terms of manageability,

Compaq has fashioned an impressive combination of hardware and software components. The software piece of the equation—the vendor's own Insight Manager—uses the widely accepted SNMP standard, and the unit supports DMI to boot.

To enter the Deskpro chassis, you need merely undo a trio of thumbscrews and remove a sweeping side panel. This reveals a packed but organized interior. To access prominent hardware, you must first remove the Deskpro's bus-slot card (3 ISA, 3 PCI, 1 shared) then pull its entire motherboard through the top of the chassis. This leaves you with unobstructed access to the motherboard's trio of SIMM slots (two occupied by SDRAM modules) and CPU, which lays—unique to the Deskpro—on its side beneath a



heat sink.

Insight Manager, the Compaq management package bundled with each Deskpro, is based on the SNMP protocol, not DMI. The Deskpro is also preloaded with the Insight Management Agent, a DMI 2.0 agent, and thus can be queried with any DMI 2.0-compliant administration tool.

When used with Compaq

machines, Insight Manager is an excellent means of taking system inventory and monitoring overall system health. Like LANDesk Client Manager, it can identify chassis intrusions, improper voltage levels, high temperatures, SMART hard disk failure, and ECC memory failure. Other remote capabilities—such as locking the system chassis, disabling various components, waking the system up, and flashing its BIOS—are supported by the Deskpro hardware but require a third-party network management package such as Microsoft's SMS.

With its 4.3GB UltraSCSI Quantum Viking hard disk and a Matrox Millennium II AGP graphics card, the Deskpro performed extremely well against its NT competitors on our High-End Winstone, Disk WinMark, Graphics WinMark, and CPUmark tests. Its overall performance was edged out by our Editors' Choice, the HP Vectra. This performance, however, comes at a price almost \$800 higher than the Dell OptiPlex and roughly \$1,200 higher than the HP Vectra.

Compaq does, however, include a 19-inch monitor, a pair of small stereo speakers, and an integrated 10/100 Compaq Netelligent Wake-On-LAN Fast Ethernet adapter. All things considered—adept hardware, an accessible chassis design, and also a polished management package—the 333-MHz Deskpro 6000 is an attractive buy.—CM

Dell Computer Corp.

Dell OptiPlex GXa 333

Among managed PCs, the Dell OptiPlex GXa 333 (\$3,449 direct) boasts one of the most

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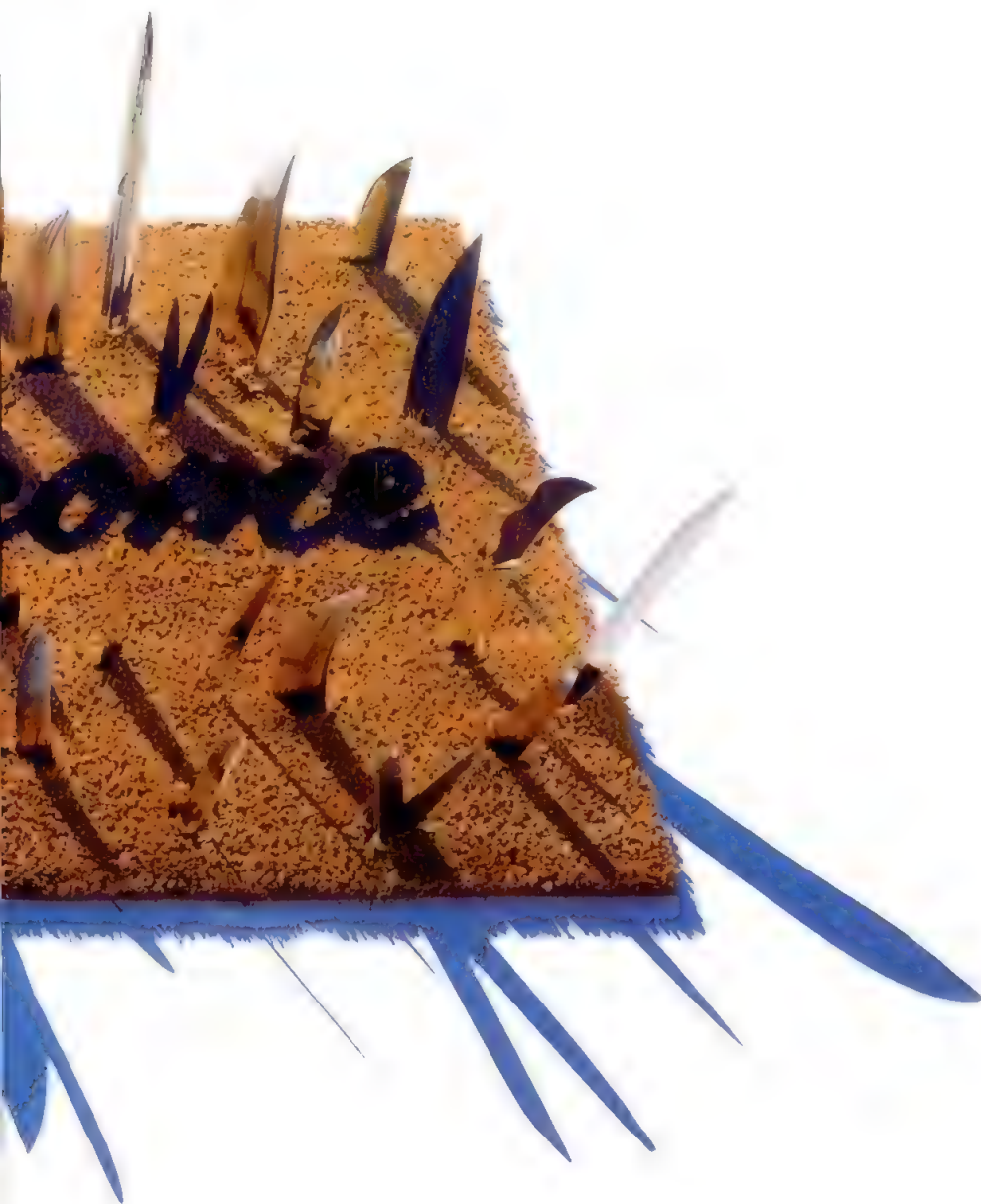


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First Looks

clever and tractable chassis designs. When performing most upgrades or repairs, you need not move this mini-tower from its upright position nor open a toolbox. Software-based management is provided by the Dell Inspector 4.1, a DMI 2.0-compliant package that operates either locally or from a remote console. The Dell GXa is priced competitively, it performed fairly well compared with the rest of this group (although its disk performance did lag slightly), and its architecture is eminently accessible and manageable.

A side panel and a front panel of the GXa's lockable chassis easily pop off to expose a fastidiously organized interior. A hinged power supply swings up to reveal three SIMM slots (one occupied by an SDRAM module) on the upper half of the motherboard, and a horizontal bus-slot card slides out to expose the lower half of the motherboard.

The machine's floppy disk drive and 24X CD-ROM drive, sitting in bays at the top of the system, come straight out with the release of adjacent metal clasps. Two internal 3.5-inch

bays, one holding the system's 4.3GB Quantum Fireball Ultra ATA hard disk, are kept in place by a Philips-head screw,



but they too swing out from the chassis once that screw is removed.

The preloaded local version of Dell Inspector has two separate interfaces for viewing DMI data: General Overview lists the machine's major hardware components in a simple GUI format; and System Details offers an extensive system inventory from a DMI browser. The Inspector Administrator, provided with each bulk shipment of PCs, inventories LAN clients in much the same way, but it also affords several non-DMI remote-control features: It can wake up or reboot the GXa (via an included Intel

EtherExpress Pro/100+ Management Adapter) and disable various hardware components (including I/O ports and the floppy disk drive). Voltage and temperature levels aren't explicitly displayed by the Inspector, but the Dell GXa automatically shuts down in the event of fan failure or excessive heat.

The Dell GXa's benchmark results were mostly competitive. The system's graphics subsystem—led by a Matrox Millennium II PCI card instead of the motherboard's integrated ATI AGP chipset—produced above-average scores, second only to the Compaq Deskpro, and it garnered the roundup's highest CD-ROM WinMark test score. Yet its DiskWinMark test score, despite a Quantum hard disk almost identical to that of the leader on this test, the HP Vectra, was a full 14 percentage points below the mean. Further equipped with a pair of Altec Lansing speakers and a 17-inch monitor, the GXa sells for slightly more than the Vectra. But each year, the GXa's convenient chassis and DMI software—in a sys-

tem backed by class-leading service and support—may save several hundred.—Cade Metz

Hewlett-Packard Co.

HP Vectra VL 7/333



Hewlett-Packard's mainstream corporate solution, the HP Vectra VL 7/333, redefines the phrase "bang for the buck" in our managed PC category, and it earns our Editors' Choice for doing so. The company has eased repairs and upgrades with a simple yet graceful chassis de-



sign and fashioned a management suite, HP TopTools, that augments the DMI 2.0 specification with a host of pragmatic remote controls. With a street

BENCHMARK TESTS

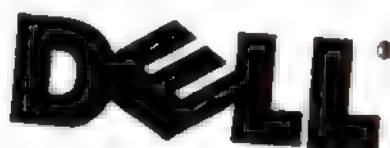
Windows NT Pentium II/333 PCs



The overall leader on our benchmark tests of Windows NT—equipped 333-MHz Pentium II PCs is also our Editors' Choice, the HP Vectra VL 7/333. This machine just edged out the Compaq Deskpro on our High-End Winstone 98 tests. It also topped the charts on our

Disk WinMark measure, thanks to a particularly adept Ultra ATA hard disk subsystem, which surprisingly beat out the Deskpro's 7,200-rpm SCSI setup. On our CPUmark₃₂ test, the Compaq Deskpro led the pack, presumably because of a well-tuned CPU-to-memory subsystem.

	ZD High-End Winstone 98 Score	ZD High-End Graphics WinMark 98 Score	ZD High-End Disk WinMark 98 Thousands of bytes/sec	ZD CPUmark ₃₂ Score	ZD CD-ROM WinMark 98 Thousands of bytes/sec
Compaq Deskpro 6000 Model 6333X	34.1	199	4,780	846	7,110
Dell OptiPlex GXa 333	32.9	138	7,810	821	1,150
HP Vectra VL 7/333	35.0	134	4,160	832	854
NEC PowerMate Enterprise 8000	32.7	153	7,560	796	972
	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶



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First Looks

price of \$3,030 and a 17-inch monitor, the 333-MHz incarnation of the Vectra VL is not only the easiest-to-manage system in our NT roundup, but it's the best performer and the least expensive as well.

The Vectra mini-tower is flanked by a pair of flush plastic levers. To remove the system's outer cover, you simply raise these levers and pull them forward. This exposes an interior divided into two distinct halves by a horizontal metal shelf. The upper half houses a bus-slot card that rests atop the shelf, a vertically oriented motherboard that plugs into the bus-slot card, and four front-accessible drive bays (two of which are occupied by a floppy disk drive and a 24X CD-ROM drive).

The lower half holds the machine's power supply and a pair of internal drive bays (one occupied by a 6.4GB Ultra ATA hard disk). The latter two bays are easily accessible through a rear door that retracts with the removal of a single screw. The bus-slot card is fixed in place, but the motherboard conveniently slides out through the top of the system.

Though many vendors offer similar chassis designs, none can match HP's software-based management. HP loads each Vectra with TopTools—an easily navigable GUI application lets you read DMI data, disable various hardware components, flash the BIOS, monitor the hard disk, and govern the boot sequence. The application's remote variant, available from Hewlett-Packard's Web site, must be integrated with a larger network management tool—namely HP OpenView, CA UniCenter, or Microsoft SMS—

but is otherwise identical to the local client. If an HP NightDirector card (\$90 street) or any other Wake-On-LAN card is installed, you can use TopTools to wake up or power on the Vectra

7/333—one that hits a home run on every count. If you're looking for a well-constructed, fast PC with the finest management solution on the market today and you don't want to break the bank to get it, look no further than the HP Vectra.—CM

NEC Computer Systems Division

NEC PowerMate Enterprise 8000

Of our roundup's Windows NT PCs, only the \$3,408 (direct) NEC PowerMate Enterprise preloads a third-party management application. Using LANDesk Client Manager, Version 3.1 (a DMI 2.0-compliant package licensed from Intel) NEC allows you to remotely wake up the PowerMate, inventory its major hardware, monitor its temperature and voltage levels, predict hard disk failures, and identify chassis intrusions. LANDesk can't flash a BIOS or disable hardware peripherals from afar, but its user-friendly GUI is in use throughout the industry.

The PowerMate mini-tower uses Intel's NLX chassis standard, which allows motherboards to slide out easily for servicing. Yet with this particular machine, removing the motherboard requires a bit more doing than usual: After unfastening

three thumbscrews and opening a side panel, you must then turn the chassis on its side and, with a fair amount of force, remove a panel on the bottom of the machine. That said, however, most upgrades and repairs can be done without extracting the motherboard; the PowerMate's interior is the least cluttered and most spacious of our roundup.

In large part, the effectiveness of LANDesk is dependent on support it receives from a machine's hardware. Using a LM78 monitoring ASIC and an Intel Wake-On-LAN Fast Ethernet adapter, the PowerMate benefits from most every LANDesk feature. Because the chassis fan in our test system wasn't attached to the appropriate lead on the motherboard, we were given a perpetual failure notification, but all other LM78 monitoring operated flawlessly. LANDesk is only a step behind TopTools in terms of usability and power.

Equipped with an ATI AGP graphics adapter with 8MB of SGRAM, an 6.4GB IBM Ultra ATA hard disk, and a 24X Hitachi CD-ROM drive, the PowerMate was a typical performer on our benchmark tests.

Despite a small glitch in its chassis design, the PowerMate's manageability is matched only by its affordability.—CM PC



remotely. You cannot, however, monitor motherboard temperatures and voltages.

During benchmark testing, the Vectra led the group in overall performance, posting a Winstone score that just edged out the Compaq Deskpro. It also produced the number-one Disk WinMark score, even though its EIDE hard disk was competing against the Deskpro's faster UltraSCSI drive.

It's not that we often see a system like the HP Vectra VL

SUMMARY OF FEATURES

Windows NT Pentium II/333 PCs

	Compaq Deskpro 6000 Model 6333X/4300/CDS	Dell OptiPlex GXa 333	HP Vectra VL 7/333	NEC PowerMate Enterprise 8000
Price of tested configuration (monitor size)	\$4,200 street (19-inch)	\$3,499 direct (17-inch)	\$3,030 street (17-inch)	\$3,408 direct (17-inch)
Graphics adapter (interface)	Matrox Millennium II (AGP)	Matrox Millennium II (PCI)	Matrox Millennium II (PCI)	ATI 3D Rage Pro Business Edition (AGP)
Memory	4MB WRAM	8MB WRAM	8MB WRAM	8MB SGRAM
Hard disk	Quantum Viking	Quantum Fireball ST	Quantum Fireball ST	IBM DHEA-36480
Capacity and interface	4.3GB Ultra SCSI-3	4.3GB Ultra ATA	6.4GB Ultra ATA	6.4GB Ultra ATA
CD-ROM drive	Hitachi CDR-8235	NEC CDR-1800	Hitachi HPD4383ACD	Goldstar CR-8240b
Speed	8X-24X	12X-24X	10X-24X	12X-24X
Network adapter	Compaq Netelligent 10/100 TX (included)	Intel EtherExpress PRO/100+ Management Adapter (included)	HP Enhanced 10/100 BT Ethernet Interface (\$90 street)	Intel EtherExpress PRO/100 (\$80 direct)
Warranty (parts/labor)	3 years/1 year	3 years/1 year	3 years/3 years	3 years/3 years
Included on-site service	1 year	1 year	1 year	1 year

Best Socket-7 Motherboard Based on Intel's TX Chipset

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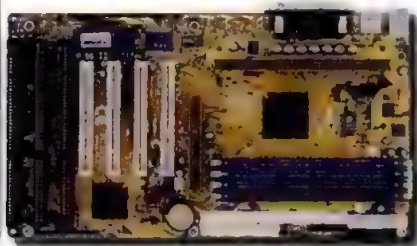
"This is Shuttle's second example of how Intel's latest chipset can be put to good use. Not only is it great with the Pentium MMX and K6, it is one of the fastest Tx based motherboards I've tested with 6x86MX chip"

AVADO Hardware Tech Page

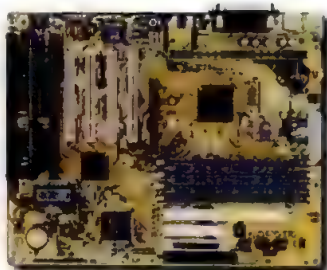
Despite of all the awards & ratings,
Shuttle still offer mainboards with high quality, exceptional performance,
reliability and expandability at a very competitive pricing.



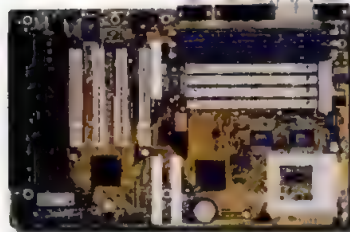
PC Direkt (Germany)
Editor's Choice



Hot-637



Hot-635



**Hot-567
(Hot-566)**



Hot-579



- | | |
|---|---|
| <ul style="list-style-type: none"> • Accelerated Graphics Port Interface (AGP) • Slot 1 for Pentium II Processor with MMX™ Technology • Supports PENTIUM II Processors Up to 300 MHz • Supports 4 banks of SDRAM and EDO DRAM | <ul style="list-style-type: none"> • Configurable support for ECC • Supports Ultra DMA/33 • Ultra-Wide SCSI Controller available on HOT-635 • Intel's LDCM (optional) |
|---|---|

- | | |
|---|---|
| <ul style="list-style-type: none"> • CPU Plug & Play • Low EMI (Easy CE/FCC) • System Manager • Power Plug & Play • Full Memory Support • Value Added Softwares <ul style="list-style-type: none"> -System Manager (Std) -Triones' Busmaster IDE driver (Std) -Win95-TX utility (Std) -Intel's LDCM (Optional) | <ul style="list-style-type: none"> • VIA VPx/97 Chipset • Supports CPU Voltage Auto-Detect • Supports SDRAM and EDO DRAM • System Manager • Supports Ultra DMA/33 • On-board 1MB or 512k PB Cache |
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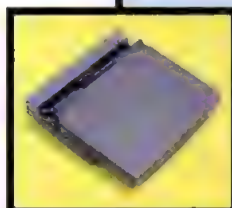


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First Looks

VIDEOCONFERENCING CAMERAS

More Talking Heads

New cameras from Intel, Xirlink, and 3Com cover the videoconferencing bases.

By Jan Ozer

Two new digital video cameras, the Intel USB PC Imaging Camera, which comes with the Create and Share Camera Pack (\$199 list), and the Xirlink Video Phone (\$150 street), preview the benefits of the Universal Serial Bus (USB) over parallel-port video cameras. But since the bottleneck that degrades quality—a.k.a. the Internet—isn't expanded by your ability to input video data at 12 Mbps (as opposed to 384 Kbps for parallel-port devices), you won't see vastly improved Internet videoconferencing.

And if you don't have a USB port on your PC yet (or if you don't even have a PC), there's still at least one videoconferencing option available: the 3Com Bigpicture tv phone (\$449 list). This device can connect you to anyone with an H.324 device, including those using computer-based devices and other Bigpicture-equipped TVs.

USB ABUNDANCE

USB ports are nearly ubiquitous on new desktop computers and are a premium feature on many laptops—and with good reason. At 12 Mbps, the new bus is blindingly fast. Also, it can supply power to digital video cameras, offer hot swapping, and daisy chain up to 127 devices.

Like parallel-port digital video cameras, USB models digitize video input before sending it to the computer. USB cameras draw power from the bus, however, while parallel-port cameras draw power from the keyboard, complicating installation.

INTEL USB PC IMAGING CAMERA

Intel ships its PC Imaging Camera with the Create and Share

Camera Pack, which contains several still-image editing tools but no full-fledged video editor—a real drawback. Despite our best efforts, we couldn't eliminate the slight blurriness in both still and video images, though color fidelity and contrast was quite good.

The camera's adhesive strip virtually



cements it to your monitor, making it difficult to share or even move it around your office. You focus, choose between low and high light conditions, and snap a picture with controls on the camera. Although the Imaging Camera has no audio capture, it does feature limited electrical tilt and pan.

Bundled software includes Intel's own Scene Recorder for still and video capture and limited editing. The program can compress video for Web distribution, but viewers must download a plug-in player from Intel's Web site. Also included are Intel's VideoPhone for Internet videoconferencing, PictureWorks PhotoEnhancer, and MetaCreations' Kai's PowerGoo.

CAPTURING VIDEO

Intel keeps its interface simple, capturing video in three resolutions (176-by-144, 240-by-280, and 320-by-240) in YUV 12 and

compressed Indeo 4.1 format. You can correct incoming video for brightness, contrast, saturation, and hue.

On our tests, Intel's files were slightly blurry, but color quality was natural and facial contrast was quite high. The camera did drop occasional frames during capture, even when working with lower-resolution 15-fps files (which didn't exceed the USB bandwidth). Still-image captures at 320-by-240 were also slightly blurry, even after we adjusted the focus controls.

Intel Create and Share Camera Pack

List price: \$199. Requires: Pentium 166/MMX with USB port, Microsoft Windows 95 (OSR2), 16MB RAM, 75MB hard disk space, SoundBlaster-compatible sound system, 28.8-Kbps modem, Internet connection (for video calls). Intel Corp., Santa Clara, CA; 800-538-3373; www.intel.com. Choose 405 at www.pcmag.com/infolink.

XIRLINK VIDEO PHONE

Aggressively priced at \$150, the Xirlink Video Phone offers a comprehensive bundle for still-image and video editing and excellent documentation. Although video was sharper than Intel's, colors in shaded areas were slightly distorted.

The camera has an adjustable-focus lens and a built-in microphone for 8-KHz, 16-bit audio capture. Xirlink bundles its own Video Phone still-image and video-capture software and Conference Center, a front end for Microsoft NetMeeting's videoconferencing, file-transfer, whiteboard, and chat functionality. Third-party tools include MetaCreations' Kai's Photo Soap and Kai's PowerGoo, and MGI's VideoWave SE video editor.

VIDEO CLIPS

The Xirlink Video Phone captures in a range of resolutions from 128-by-96 to 704-by-576 in 24-bit color, YVU 4:2:2, and the more compressed YVU12 and YVU9 formats. You can adjust video brightness, contrast, hue and saturation, and white balance and gamma values. Xirlink captures in its own proprietary .XVR format, and it can be converted to .AVI format.

On our tests, the Video Phone tended to convert low-light areas into a maroon tinge, though facial tones remained accurate. The video was crisp for relatively still talking heads, but it became blurry with exaggerated motion. Still-image captures were blurry at the digitally zoomed 704-by-576 resolution, but smaller images were much sharper.

The Video Phone captured at 30 fps at 320-by-240 resolution in YVU-9 format without dropping frames (this is much better than the Intel camera). The camera captured without dropping frames at 15 fps in both quarter-screen and Internet-size resolutions in YVU9 and the higher quality YVU12 format.

Xirlink Video Phone. Street price: \$150. Requires: Microsoft Windows 95 or Windows 98, 90-



MHz Pentium, 16MB RAM, 10MB hard disk space, USB port. Xirlink Inc., San Jose, CA; 408-324-2100, fax: 408-324-2101. www.xirlink.com. Choose 406 at www.pcmag.com/infolink.

BIGPICTURE TV PHONE

3Com's Bigpicture tv phone virtually converts your television into a videoconferencing station that's compatible with any H.324 device. The Bigpicture is extraordinarily easy to install and use, and its only drawback is that familiar analog videoconferencing bugaboo—video quality. By limiting motion to the bare minimum, however, the video is clear enough to warm a grandparent's heart or add valuable context to an online business meeting.

TALK BACK TO YOUR TV

The Bigpicture is a combination modem/camera that you connect to your television via the cable input or separate audio/video connections (if available). The unit has two RJ-11 jacks, one for the incoming line and the other for the regular analog phone used to make calls and control all conference options.

You speak into the analog headset or speakerphone and listen to the television speakers. You can use both the phone and the television set normally when not videoconferencing.

When you dial a phone number, the television displays the normal modem training messages until you connect, and then the conference begins. Pressing the pound sign on the phone's keypad brings up a menu with an extensive list of options. You can control whether you're watching the local or remote screen, or you can watch both on-screen simultaneously. You can also select the size of the video window and toggle between various levels of sharpness and frame rate.

The camera has remote-control pan, tilt, and zoom, which—combined with auto-answer ca-

pabilities—lets the phone operate as a remote security device. A privacy option lets you stop sending video frames.

On our tests, we achieved optimal results with a medium-size



picture and the sharpness/frame-rate control set in the middle. So long as motion was limited, the images remained sharp, the audio was clear, and the approximate 7- to 10-fps frame rate

showed a useful hint of audio/visual synchronization. We also found the controls very accessible, even for nontechnical users.

By working with a lower-resolution television set, the Bigpicture displays on a medium much more forgiving than the pixel-perfect computer monitor, improving perceived video quality. It also helps bridge the videoconferencing gap between the computer literate and the as-yet unenlightened, whether they be in board rooms or living rooms.

Bigpicture tv phone. List price: \$449. Requires: TV with either cable or separate audio/video connections, telephone and analog line. 3Com Corp., Santa Clara, CA; 800-342-5877, 408-764-5000. www.3com.com. Choose 407 at www.pcmag.com/infolink.

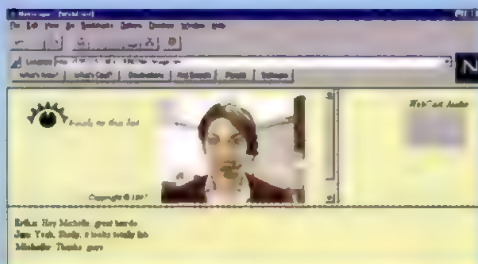
Four-Way Internet Conferencing

Galacticomm's WebCast Personal (\$49 list) lets you broadcast one audio/video image to up to four remote users over the Internet, with text-chat facilities for all-way conferencing. Playback is Java-driven, so remote conferees don't have to download any plug-ins or applications. Though operation was generally acceptable for surveillance applications and consumer conferencing, most business users should opt for more fully featured programs like Microsoft NetMeeting.

Essentially, WebCast converts your computer into a conference server, which all users log into. The program generates all Web pages for log-in and the conference, which takes place in a framed page with three windows—one for the video, one with the group chat, and one to enter your own text-chat comments.

Up to four users connect to the conference by entering your URL, which the program supplies, or through a server at the Galacticomm Web site. Conferees work through their browsers (Netscape Navigator 2.0 or Microsoft Internet Explorer 4.0 or higher), and the required Java files (about 8K for video and 65K for audio) are automatically downloaded and the user logged in. The conference host works from the WebCast program screen, which lists all participants and displays the video, the ongoing chat, and a connection log.

The audio/visual elements of the conference are strictly one-way. Although all conferees can see and hear the host, they cannot communicate back to the host or to each other except via chat. The program works with any .AVI-compatible capture card and video source or parallel port or USB cameras.



SCENE: Through WebCast's three-screen window you can view your host and chat with the group.

On our tests (performed on a T1 connection), the system achieved about 3 to 5 fps of fair quality video, reasonable by Internet conferencing standards. Nevertheless, sound synchronization was poor, with audio following video by as much as 10 seconds. Text chat worked largely as advertised, though there was no way to save the chat contents.

WebCast works best in situations where you want to monitor a static scene periodically. Though Web-

Cast's plug-in and download-free operation is attractive in consumer settings, most business users will opt for programs with duplex audio/video conferencing and more advanced chat facilities.

WebCast Personal. List price: \$49 (\$29 if downloaded). Requires: Microsoft Windows 95 or Windows NT 3.51 or higher, video source, SLIP/PPP or direct Internet connection. Galacticomm Technologies Inc., Fort Lauderdale, FL; 800-328-1128, 954-583-5990, fax: 954-583-7846. www.gcomm.com. Choose 408 at www.pcmag.com/infolink.

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First Looks

HTML EDITORS

Weaving a Web Page

Macromedia's Dreamweaver provides extraordinary features for building DHTML Web pages.

By Jan Ozer

Macromedia Corp.'s Dreamweaver aims squarely at advanced HTML coders, and it largely hits the mark. Dreamweaver (\$500 street; \$300 street through March 1998) provides extraordinary features for building and debugging Dynamic HTML (DHTML) and Cascading Style Sheets (CSS). But those creating less bleeding-edge sites should stick with cheaper editors that provide more structured guidance.

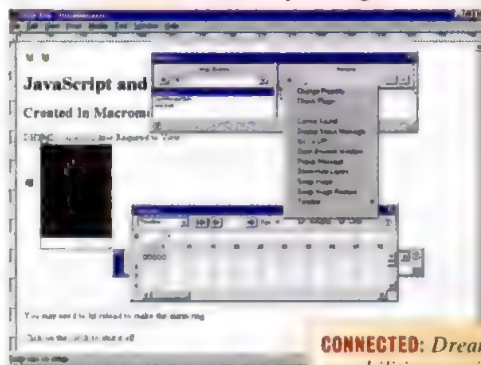
Dreamweaver is a WYSIWYG HTML editor, but with convenient, real-time access to an internal HTML editor or any third-party HTML editor, including the bundled Allaire HomeSite 3.0. The program uses floating windows, one of which enables one-click insertion of images, tables, Java applets, and other objects, which bring up the properties window for customizing your objects.

Dreamweaver is light on tools for getting started, with only nine page-only templates and no ability to apply styles for an entire site simultaneously. That said, Dreamweaver simplifies site creation by forcing you to copy all external assets into the proper subdirectories as soon as you use them, so that you build a disk-based mirror site to match your ultimate Web site.

DESIGN BASICS

Although Dreamweaver can't download Web sites or input .DOC, .WKS, or similar files, its HTML import capabilities are extensive. A feature called Round trip HTML preserves the HTML input's original con-

tent and structure, maintaining the integrity of the original design. If so configured, however, the program can parse all HTML input, noting and fixing errors such as incomplete tags.



CONNECTED: Dreamweaver's DHTML capabilities are simply the best. The behaviors screen lets you select actions and have them occur on selected events, such as mouse-over and mouse-click.

Dreamweaver competently handles the insertion and creation of basic page components, providing the ease of use and flexibility of most other WYSIWYG programs. To guard against overuse of images and other bulky design elements, the program displays estimated page-download times on the status bar.

An integrated image-map editor runs inside the page-creation window, which is a useful time-saving feature. But otherwise, Dreamweaver's multimedia features are perfunctory, with generic ActiveX, plug-in, and JavaScript controls. Support for Macromedia's Director and Flash formats is far more extensive, however.

SWEET DREAMS

Dreamweaver hits its stride when working with advanced functions such as CSS and DHTML, which require advanced browsers but are clearly the wave of the future. The pro-

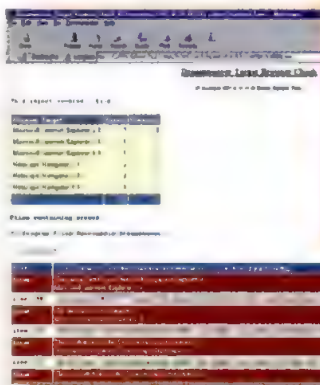
gram simplifies CSS creation and utilization by integrating 65 design elements into its style template, which you can separately embed in a page or save as a .CSS file for linking with other pages.

Dreamweaver also supports layering, a CSS feature that lets developers include multiple layers in their pages. Part of the layering specification enables pixel-accurate layout, which Dreamweaver supports with ruler, grid, and snap-to-grid commands.

DIRECTOR MEETS THE WEB

Dreamweaver's unique strength lies in animating objects via DHTML using two controls: behaviors and a timeline. Behaviors

let you assign actions to any object based on a number of conditions, including mouse-over and mouse-click. Dreamweaver lets you set your browser targets (Microsoft Internet Explorer 3.0 and Netscape Navigator 3.0, for example) and displays only the controls available for those browsers.



SEE IT ALL: Dreamweaver checks HTML code against the capabilities of selected target browsers, warning you when your code outstrips your customers' ability to view it.

timeline works as a keyframe animator: It lets you move an object around the screen, setting keyframes at various locations to anchor the motion.

Between the two controls, you can create an unparalleled degree of motion and interactivity, all in low-bandwidth JavaScript and DHTML code that translates to fast download times and site responsiveness. On our tests, the code generated by Dreamweaver degraded gracefully on browsers that didn't support the required features; in other words, all assets displayed, but without motion or effects.

You can preview in any browser, and Dreamweaver's excellent utility Target Browser checks compatibility with Internet Explorer and Navigator, Versions 2 to 4, compiling a report with error information, warnings, and explanations. For transferring the assets to the Web site, Dreamweaver's FTP module is competent, but the site management capabilities as a whole are limited.

Dreamweaver's Round trip HTML makes the program the perfect WYSIWYG complement for coders who perfect their work in text editors. Though most of its advanced DHTML and CSS features won't be fully relevant until the world upgrades to 4.0 browsers, now is the time to start integrating less advanced elements into your Web pages.

Macromedia

Dreamweaver. Street price: \$500 (\$300 through March 1998). Requires: Pentium PC, Microsoft Windows 95 or Windows NT 4.0, 16MB RAM,

20MB hard disk space. Macro-

media Corp., San Francisco; 800-945-9076, 415-252-2000; www.macromedia.com. Choose 402 at www.pcmag.com/infolink.



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First Looks

MULTIFUNCTION PRINTERS

Office Space Saver

Panasonic's KX-PS8000 Digital Color Imaging System offers color prints, scans, and copies that you can be proud of.

By M. David Stone

People will probably think of the Panasonic KX-PS8000 Digital Color Imaging System (\$9,995 list) as a multifunction device for color printing, scanning, and copying. But it's much better than the category suggests. Most multifunction devices do one thing well at most. The Panasonic KX-PS8000 is better understood as a 1,200-dpi color laser printer and a 600- by 2,400-dpi optical resolution scanner in one package. Each part can hold its own against the single-function competition, but they both have the advantage of being designed to work together.

PUTTING THE PIECES TOGETHER

The scanner and printer are separate, stackable units. The printer is built around the same Matsushita (Panasonic's manufacturing arm) engine as the Tektronix Phaser 560, which earned an Editors' Choice in our most recent color laser printer roundup ("Clean, Crisp, & Color," October 21, 1997). That means it offers the same easy setup and maintenance, a claimed 3.5-page-per-minute (ppm) speed for color and 14-ppm speed for monochrome, and a claimed 12,000 pages per black toner cartridge and 10,000 pages for each color cartridge (but only 3,000 pages for the starter cartridges that come with the unit).

One unusual aspect of this unit is that it has a SCSI port as the preferred connection. You'll also find a parallel port, but if you use it you won't be able to use the scanner unless you connect to a SCSI port separately. An Ether-

net server card with a processor, spooling firmware, and a 10Base-T connector is a \$799 option.

The last step in hardware setup is color calibration using the printer's front-panel LCD menus. Clear instructions in the quick-start guide make calibration easy. Installing the GDI printer driver and the scanner's Twain driver in Microsoft Windows 95 is straightforward Plug and Play. The CD also includes

thin horizontal bands in most images. Panasonic says this is caused by the GDI driver and that it shows up only with specific graphics chip sets. To eliminate the problem with these chip sets, you have to turn off the driver's proprietary color-matching feature. The bands did not show up when we used the scanner plus printer as a copier.

Note also that 1,200-dpi resolution is not available in photographic color mode unless you have between 24MB and 64MB of RAM (depending on paper size and color). Surprisingly, though, 300-dpi output looked better than 600-dpi output for photos on our tests, with the

minute faster. Panasonic says the speed would improve with more memory. We tested with 24MB of RAM, but the unit can be upgraded to 80MB using standard SIMMs.

SCANNING AND COLOR-MATCHING

The other piece of this package is a 30-bit flatbed scanner with a 50-page ADF and 600-by-2,400-dpi optical resolution. We found that it worked as promised, whether scanning high-quality images into PhotoShop or printing color copies. The scanner has its own front panel, complete with separate copy buttons for color and black and white. The company also includes the Xerox

TextBridge OCR package and Corel PhotoPaint.

The scanner and printer are fine-tuned for color-matched copies. On our

tests, copies were reasonably close to their originals. Oranges and reds showed a small but distinct shift to magenta, while blues were generally darker. Still, the color match was certainly much closer than you would get from a scanner and printer chosen at random. Copy speed was also better than you would expect from pairing an unrelated scanner and printer.

All told, this package delivers most of what it promises. But before buying the Panasonic KX-PS8000, you might want to check with the vendor to make sure your PC's graphics card won't cause a problem with the GDI driver.

Panasonic KX-PS8000 Digital Color Imaging System. List price: \$9,995. Requires: SCSI, parallel port, or Ethernet connection; Microsoft Windows 3.x, 95, or NT 4.0. Panasonic Communications and Systems Co., Secaucus, NJ; 800-742-8086, fax: 201-348-7074; www.panasonic.com/alive. Choose 401 at www.pcmag.com/infolink.



net server card with a processor, spooling firmware, and a 10Base-T connector is a \$799 option.

VARIABLE OUTPUT

The Panasonic KX-PS8000's output quality for monochrome text and graphics matches monochrome lasers with the same resolution. In many respects, color output is a match with that of the first-tier color laser printers from our last roundup. In graphics, gradients shade from one color to another with little or no banding, thin lines are sharp and even, and solid areas are entirely filled in. In photos, colors shade well enough to give subtle cues of three-dimensionality.

Color output is marred by

lower resolution yielding more subtle shading and less posterization.

PERFORMANCE

Lower resolution also yields faster printing—our Adobe Pho-

toShop test images printed in 2:34 at 600 dpi but only 1:42 at 300 dpi. These fast speeds are presumably due to the SCSI connection, at least in part. As a point of reference, the fastest time in our last color laser roundup was 6:11 for the 300-dpi Hewlett-Packard Color LaserJet 5M.

At 2:04 with default settings, the printer was relatively slow for monochrome text. The slowest true-color laser printer in our last roundup was almost a full



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First Looks

DESKTOP PUBLISHING SOFTWARE

Building a Better Book

Quark introduces the long-awaited update to its flagship desktop publishing package.

By Luisa Simone

QuarkXPress 4.0—the much-anticipated upgrade to the leading desktop publishing program—has finally arrived. Playing catch-up with its competitors, QuarkXPress now offers long-document functions that allow users to compile books, lists, and indexes easily. On the downside, HTML output options are nonexistent.

BOOK IT

The book list automatically updates page numbers across chapters and also offers a powerful synchronization function that ensures consistency by copying defined styles from a designated Master chapter. Going Adobe PageMaker one better, QuarkXPress can handle multiple lists per document, such as chapter-by-chapter contents, a list of illustrations, or a table summary. Each entry in a QuarkXPress index can contain up to four sublevels, refer to either a single page or a page range, and function as cross-references.

These new functions don't compete with the more powerful functions that are found in Adobe FrameMaker, Corel Ventura, or third-party Quark XTensions. For example, QuarkXPress cannot create numbered lists based on a paragraph style. It also does not treat chapters or section numbers as variables that can be dynamically renumbered. On our testing, we were disappointed that the list of existing index entries for Chapter 1 were not made available in the index palette to subsequent chapters in the book.

DTP TOOLS

Version 4.0 of QuarkXPress has also beefed up its already robust desktop publishing tools with features normally found in vector illustration programs. Chief among the new functions is the ability to draw Bezier shapes, lines, and text paths. These drawing tools are not intended to create sophisticated illustrations, though. Editing a Bezier curve, for instance, is limited to moving tangent handles and switching among smooth, symmetrical, and corner nodes. But when coupled with standard geometric shapes and Boolean operators (to generate unions and intersections from a group of selected objects), these tools let you create complex and elegant containers for imported words and pictures.

Objects drawn in QuarkX-

curve and start typing.

QuarkXPress can use the vector paths, alpha channels, or nonwhite pixels of an imported picture to generate a clipping path. This hides unwanted background and provides a boundary for text wrap.

Other long-awaited amenities include an 800 percent zoom,

wait for an Acrobat .PDF import/export filter, because Version 4.0 does not ship with one.

A separate program, Quark-Immedia, produces a proprietary electronic-document format for the Mac. Designers looking to create both print and electronic publications and corporations seeking to move

legacy documents from paper to screen will find this hard to forgive.

Users can continue to supplement the core features set with third-party XTensions, but this requires an additional purchase. And because the Windows version of QuarkXPress 4.0 has been totally rewritten in 32-bit code, older XTensions must be upgraded. Still, increased compatibility

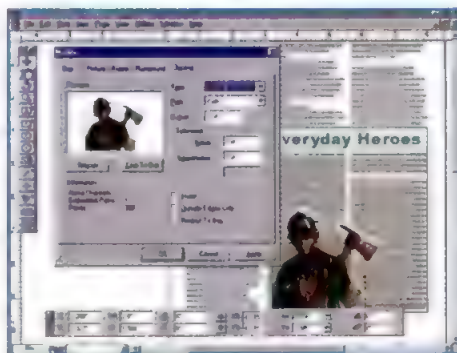
between the Windows and Mac code bases promises to make a wider variety of XTensions.

THE TEST DRIVE

During testing, we experienced only minor problems. When you resize a group, attributes (such as line width) that shouldn't be resized are enlarged or reduced along with the frames. The text-import filter doesn't recognize Microsoft Word 97 files (although Quark has promised to post an updated filter on its Web site). And with a new total of eight undockable palettes, the workspace gets really cluttered.

Dedicated users of QuarkXPress will like this upgrade. It adds long-requested features, enhances the program's creative layout tools, and preserves the familiar Quark interface.

QuarkXPress 4.0. List price: \$995. Requires: 486 or faster CPU, Microsoft Windows 95, Windows NT 3.51, or later, 12MB RAM, 12MB hard disk space, VGA graphics adapter. Quark Inc., Denver, CO; 307-772-7100, fax: 307-772-7123; www.quark.com. Choose 400 at www.pcmag.com/infolink.



ALL AROUND: With QuarkXPress, text is able to flow around both sides of a graphic.

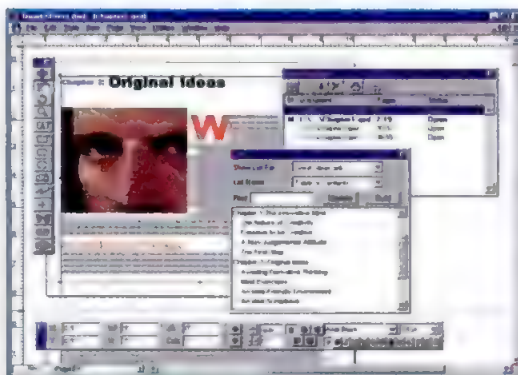
character styles, text wrap around both sides of a graphic, and custom dash and stripe patterns. You can search and replace text styles, include noncontiguous pages in a print range, and interactively resize grouped elements. Kodak's Digital Science CMS, which utilizes standard

ICC device profiles and generates Pantone Hexachrome separations, replaces the antiquated EFI Color XTension.

SHORTCOMINGS

There remain three important areas in which QuarkXPress 4.0 falls short. The program does not provide layering, which in turn makes it difficult to organize a complex lay-

out. It cannot generate tables, forcing users to grapple with old-fashioned tab settings. Most puzzling is Quark's decision to ignore Web publishing on the Windows platform by not including any HTML output options. And users will have to



IT MAY LOOK THE SAME: You control the new QuarkXPress book and list functions using familiar palettes.

Press are very flexible. You can, for example, convert any shape from a picture box to a text frame—and vice versa. You can even select text and transform the individual letter shapes into Bezier boxes. Aligning text along a path is even easier—just draw a

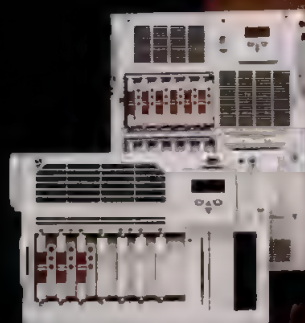


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First Looks

FINANCIAL ANALYSIS SOFTWARE

Fabulous Forecasts

Business Forecast Systems adds a slick Windows 95 interface to its family of statistical forecasting products.

By Barry Simon

Whether the problem is figuring out next quarter's sales or worrying about how much raw material to have on hand, forecasting is an important part of many business decisions. Forecasting software focuses on looking at historical data for trends and seasonal variations and using robust statistical methods to predict future values.

Forecast Pro, from Business Forecast Systems, introduces an easy-to-use Microsoft Windows 95 interface to its standard and Forecast Pro XE versions (\$595 and \$995 list, respectively). Two other important new elements include an expert system for choosing a method of analysis and the

use of ODBC to allow the import of data from native databases (supplementing the standard Microsoft Excel support).

Forecast Pro lets you import or enter seasonal data, graph it to see trends, and automatically generate forecasts with indicated bands of possibilities (once you have chosen a level of statistical significance). The automatic procedures involve an expert system that analyzes your data to figure out the best statistical method.

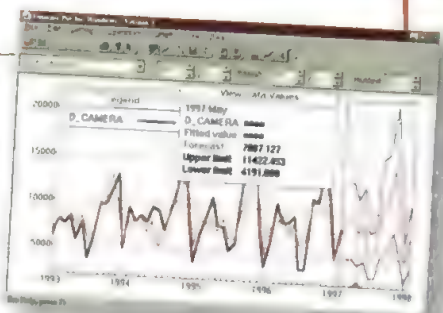
Those with no statistics training can use Forecast Pro, but it allows considerable customization for the more knowledgeable, including a choice of methods among simple moving averages, Croston's intermit-

tent-demand model, and dynamic regression.

Forecast Pro XE adds several tools for advanced users. It can adjust for one-time events, group data sets into categories to analyze collections as well as individual data sets, and add a method (Census X-11) that lets you see trends with the seasonal effects removed.

Forecast Pro's requirements for imported data are rigid and would benefit from more user control over the import process. Also, the program's reports use ASCII format with spaces to separate columnar data, so you'll have problems if you use proportional fonts. Ideally, the program would produce .RTF or .DOC files with data in tables. At a minimum, using tabs to separate data should be an option.

These are minor complaints, though. Those who need to



UPS AND DOWNS: Forecast Pro graphs raw data and forecasts for the data with confidence intervals.

forecast trends should put Forecast Pro high on the list of must-have software.

Forecast Pro for Windows and Forecast Pro for Windows XE, Version 3.0. List price: \$595 (standard version), \$995 (XE version). Requires: Microsoft Windows 3.1 or higher or OS/2 2.x, 4MB RAM, 4MB disk space. Business Forecast Systems, Belmont, MA; 617-484-5050; ourworld.compuserve.com/homepages/forecastpro. Choose 403 at www.pcmag.com/infolink.

DEVELOPMENT TOOLS

Easy Beans

Sun's Java Studio takes the programming out of assembling JavaBeans components.

By Richard V. Dragan

Sun Microsystems' Java Studio 1.0 (\$79 list) is designed to make Java, Sun's own invention, accessible to everyone. It lets HTML designers and nonprogrammers use Java effectively in a powerful, visually appealing development environment.

The Java Studio's intuitive interface features a component palette containing more than 50 JavaBeans, which can be assembled to create Java applets or standalone Java applications. There are basic graphical user interface (GUI) beans, such as buttons, labels, and more advanced components (including those for multimedia and databases).

Unlike other Java tools, Java

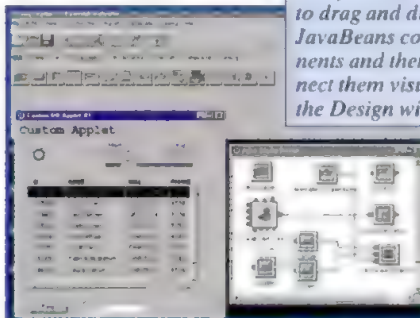
Studio lets you view your Java components in real time in the program's GUI window. This means that as you drag and drop components into the window, they are displayed exactly as they will appear in the finished product. Your application is always live and on display.

The Design Window is where much of the development work takes place and where the intelligence of Java Studio really shines. In order to customize the appearance of a control, you must choose Java Studio's Customizer window to change basic properties (such as name, label, and font) as well as component-specific properties (such as the image to display in an animation control).

You can connect JavaBean controls to one another by dragging and dropping components together. And different connection points are used to specify different actions or values. For instance, you can start an animation by attaching a button to a

different connection point.

You can also connect components to one another to have them interact, all without even thinking about the underlying Java code. On testing, this let us



DESIGN WINDOW:

The Java Studio interface allows you to drag and drop JavaBeans components and then connect them visually in the Design window.

view a simple database via the included JDBC support. Nevertheless, for calculations and conditional programming, this approach is a little more complicated. And those familiar with coding will likely miss the access to basic code.

Debugging without source code is a little tricky. The Debug bean let us log a message to a window or file whenever certain

events occurred. Though not as powerful as traditional debuggers, this method works well enough for most tasks. Once you have built a Java applet or application, a wizard lets you deploy it easily in a JAR/.ZIP file and has support for browser-based deployment, another absolutely necessary feature.

With its combination of interface smarts and a powerful visual way of working with Java, Java Studio is a good choice for Web developers who want to use Java without programming. **Java Studio 1.0.** List price: \$79. Requires: Pentium/100 CPU, Microsoft Windows 95 or Windows NT 4.0, 32MB RAM, 30MB hard disk space, CD-ROM drive. Sun Microsystems Inc., Mountain View, CA; 800-786-7638, 512-434-1511; www.sun.com/studio. Choose 404 at www.pcmag.com/infolink.

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Second Looks

MICROSOFT INTERNET EXPLORER 4.01

An Optional Upgrade

By Edward Mendelson

Recently, we awarded an Editors' Choice to Microsoft Internet Explorer 4.0 ("Face-Off," November 18, 1997). Since that time, Microsoft has posted an upgrade on its Web site. Version 4.01 of the browser, available only for Windows 95 and NT 4.0, contains no major enhancements but incorporates minor bug fixes that are designed to improve stability and resolve installation problems on some Compaq Presario computers. It also comes with two security-related patches that were previously posted on Microsoft's Web site. The only visible changes are new icons that prominently display the Internet Explorer "e" symbol and new accessibility options designed for users who rely on software that reads text aloud on-screen.

Microsoft doesn't say so explicitly, but the new accessibility features give users significantly increased control over the legibility of remote pages. If you turn on these features, you can turn off colored backgrounds on Web pages and force the browser to use the same font and point size for all text, ignoring the font specified by a Web page's author. Another option forces the browser to use your own customized choices of fonts and point sizes for different heading levels, tables, and text.

If you have not experienced stability problems with IE4, then you probably don't need Version 4.01. According to Microsoft, the upgrade is "not recommended for users who are currently satisfied" with Version 4.0. Users who will definitely want

the upgrade include owners of Compaq Presario machines that came with Home Base. Compaq's custom Windows shell. The installation program that came with the original version of IE4 overwrote the Home Base program. A fix that removes Home Base before IE is installed has been available on Compaq's Web site since late October 1997 (www.compaq.com/athome/ie40/hbmodels.html), and it is now incorporated in the new IE installer. An-

contains an address beginning with "res://" could cause IE to crash if the address had more characters than the browser supports. These extra characters could then form a malicious executable that could run on a user's machine.

The third fix deals with the Page Redirect problem, in which a malicious Web site was able to capture the user name and password you had used to gain access to a Web site (which then redirected you to the malicious site).

STILL NEEDS WORK

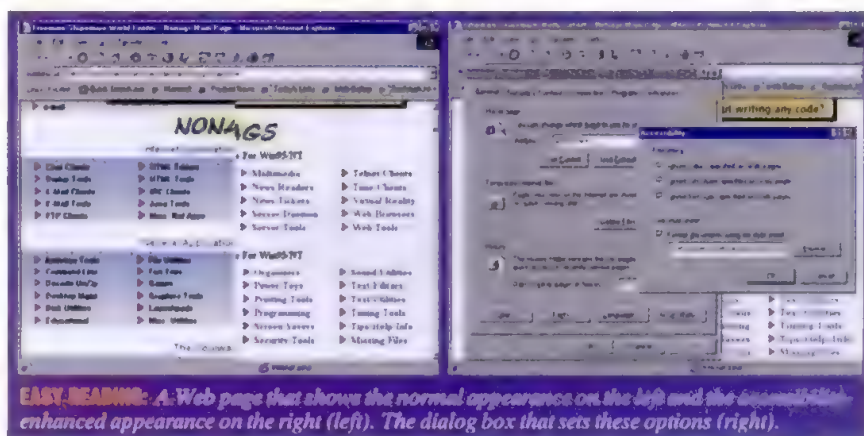
IE 4.01 doesn't include fixes for problems we previously reported (Second Looks, December

were promised by the vendors, but they have not yet been posted on Adobe's or Symantec's Web sites.

Some other minor annoyances remain unfixed in the new version. Despite the new accessibility enhancements, some interface features remain inaccessible to keyboard users. In IE4, the "Explorer Bars" that optionally appear in a vertical panel and display lists of Internet shortcuts and recently visited sites can be fully navigated with the keyboard only if the lists are short enough to fit entirely within the browser window. If the lists extend below the window border, there is no way to

reach the foot of the list without your using the mouse. This remains in IE 4.01, although a vendor representative confirmed that Microsoft is committed to full keyboard accessibility in IE.

When you install IE 4.01, the program's help



EASY READING: A Web page that shows the normal appearance on the left and the enhanced appearance on the right (left). The dialog box that sets these options (right).

other problem that's fixed in 4.01 is a frightening bug that caused some systems to boot up with a blank desktop and no start button or taskbar after IE's optional Active Desktop feature had been installed.

SECURITY LEAKS PATCHED

Three security patches made available earlier are incorporated into IE 4.01. One fixes the so-called Freiburg text-viewing patch, which allowed a malicious Web site to view a text or graphic file on your computer if the site knew the exact name and directory of the file. A second fix deals with the so-called Buffer Overrun issue. Without the fix, a malicious Web site that

16, 1997) that are caused by IE4 in third-party software like Adobe PhotoDeluxe 2.0 and Symantec Norton Utilities 2.0. Both programs use Internet Explorer 3.x components to display some screens or parts of screens. When IE4 is installed over IE 3.x, these screens turn blank.

The problem results from a change Microsoft made in IE4 to conform more closely to HTML standards that specify where certain elements must be located on an HTML page. The pages used by PhotoDeluxe and Norton Utilities placed those elements where IE3 expected them, and IE4 ignores those elements and displays only a blank screen. Fixes for both programs

screens continue to list the version number as 4.0. If you want to be sure you are using Version 4.01, you should go to the Help/About Internet Explorer menu and check the version number, which should appear as 4.72.2106.8 or later. Internet Explorer 4.01 is not an essential download for most users, and you do not need to rush over to Microsoft's often overloaded servers to get a copy. But if you want the new accessibility features—or merely the new icons—you can find the new version at www.microsoft.com/ie.

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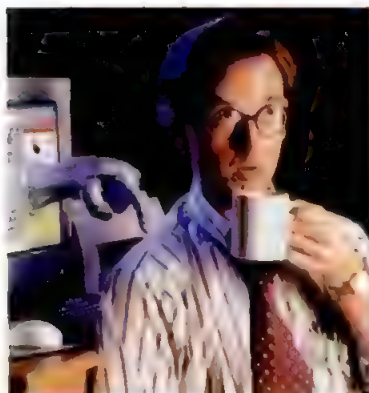
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Windows Magazine, 4/97

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Is It Real, or Is It Kodachrome?

My January 6, 1998, column on macro photography ("How Close Can You Get?") was a big hit with the medical crowd.

Doctors and dentists have been doing macro photography for years, and they're always searching for ways to bring the cost down and

the speed up. With the advent of inexpensive digital cameras that offer resolutions higher than 640-by-480, these professionals can do effective medical imaging.

I like medical practitioners who are gadget hounds, especially the ones who work with their hands. When I needed the services of a surgeon some years back, I was thrilled to find that the person recommended to me restored antique watches and clocks as a pastime. I figured that anybody who had the eye/hand coordination needed to work on those delicate innards was qualified to work on my delicate innards. A low golf handicap doesn't do it for me; oil painting does.

That burning desire to know how things work—and to fix them—underlies a craving for the right tools for the job, whether it's a laser scalpel, a 400,000-rpm drill, or the latest hardware and software with which to visualize, record, and analyze a patient's problem. Medical professionals are early adopters of new technologies because they recognize the benefits, find applications in their work, and can afford the high cost of entry.

I've had running e-mail conversations with a number of doctors and dentists, as well as with other macro photography enthusiasts. Some have taken the high road, with digital backs for their Nikon systems and dye-sublimation printers, while others are finding benefits with the higher-end digicams. One of the issues that's arisen is the choice between film and digital video. Several people have observed that when you take a photograph and scan, quality is still markedly better than that of a high-resolution digital snapshot, even for Web pages. Scanned slides and photos yield far higher resolution than digicams do. Even when you can't use all the resolution, film often looks better, subjectively.

I've used a Schneider Componon enlarging lens on a bellows with my old 35-mm Canon FT body and gotten superb conventional macro photographs. I also built a reversing ring for my Canon 50-mm lens that can go onto extension tubes or the bellows. Both have very flat fields (especially the Componon) and terrific contrast; they have much more "kick" than do the lenses found on the typical camcorder or

digicam. In this regard, digicams have a long way to go before they really equal conventional photography.

But some subtle effects are at work here, too. People are conditioned to respond differently to the film color gamut, the TV color gamut, and the print color gamut. I

think one of the reasons that people like the photos from the Canon PowerShot 350 so much is that it's biased toward red, kind of like Polaroid film. People look healthy and everything has a warm glow.

Most of the "filmed" TV shows you see these days are shot on high-definition video and then transferred to film. The studios' HDTV equipment has a greater color gamut than film does, but it's too "real," too here-and-now-looking, for a sitcom or drama. Film also tracks differently as light areas transition to shadow. Reciprocity failure and other effects having to do with the density of emulsions are at work both in the film and in photographic paper to give a different feeling of depth than you get with TV-like imaging devices and ink jet printers.

Live shows and live-to-tape shows have a much different feel than filmed shows. They convey real time or, as we learned during the 1996 summer Olympics, "plausibly real" time. Putting the same thing on film gives it a somewhat disembodied feel, while warming up and saturating the colors. It's more engaging and more dissociated at the same time, because you know it was shot at some prior time.

Even a run-of-the-mill scanner does a good job of capturing the "film" look when you scan a picture, and a monitor showing 16 million colors conveys the film look, too. Someone ought to come up with a "film" filter for the photo-processing programs that convert digicam and camcorder images. Kai's Photo Soap comes pretty close in emulating a film look, with its various sliders and adjustments.

Photography is more than what meets the eye. It's what meets the brain and a lifetime of cultural experience. Will future generations of digicams and printers change our expectations of what a good photograph looks like, or will the technology adapt to our existing biases? 

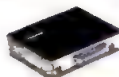
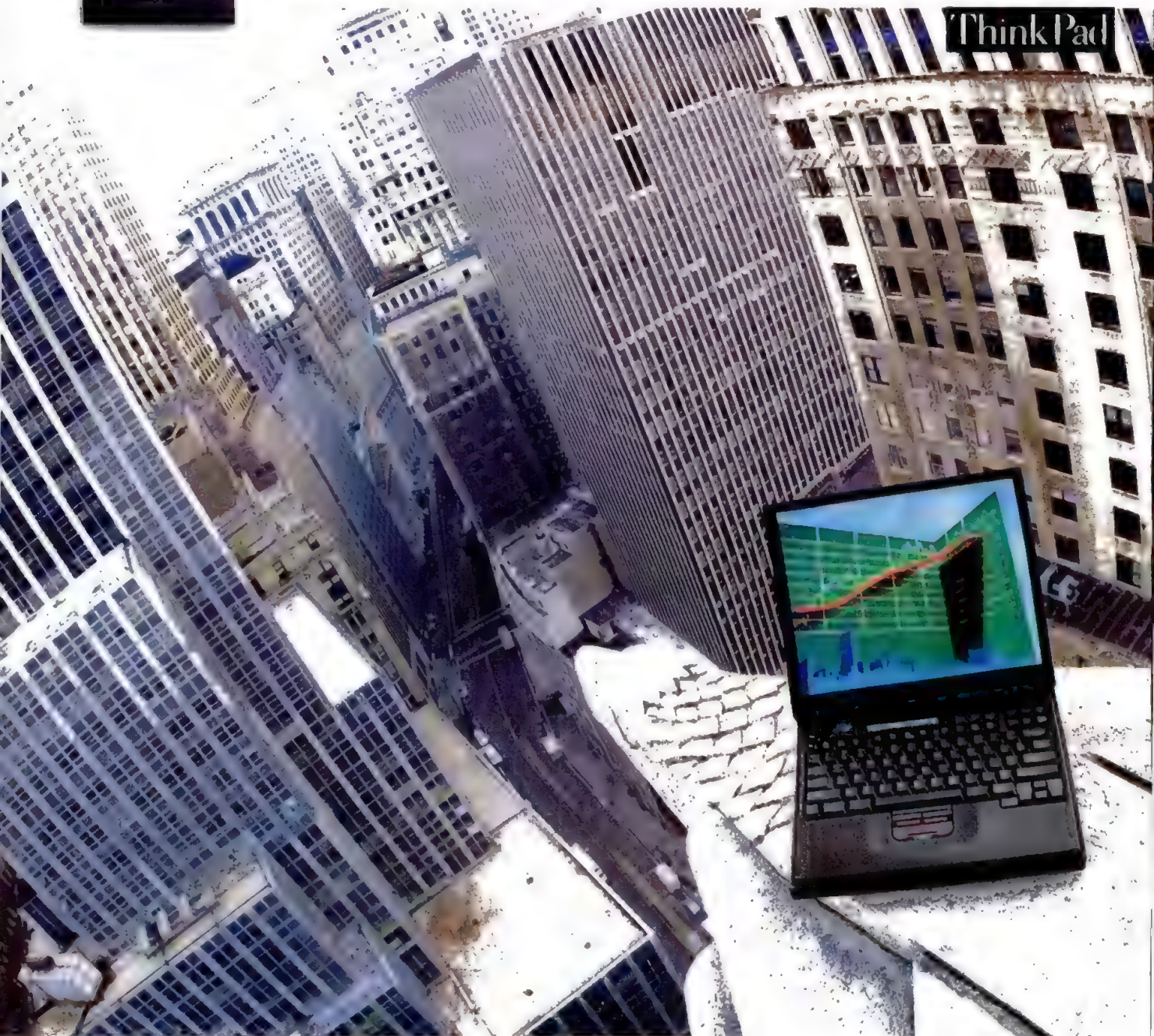


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Will the PC Market Collapse?

I don't like the feeling I'm getting regarding the health of the PC industry. For one thing, the industry is too hot right now. Comdex was bigger than ever, and more and more people are buying new machines. It's a perfect time for a collapse as far as I can tell.

Let's look at some indicators and recent trends.

We may as well begin with the least-understood trend in the industry—the emergence of the sub-\$1,000 PC. This phenomenon caught even the cautious IBM off guard. Within months, the Compaq strategy resulted in a 40 percent market share for that category of machine. Though I have always believed this is a viable and potentially hot market, I am surprised by just how hot it is. It's so hot that I believe there are little-understood factors involved; the trend can't be explained just by the simple theory of pent-up demand.

I'm convinced that many if not most of these machines are replacement units for those on budgets. The machines are even cheaper without monitors, which users in the replacement market usually already have. The irony here is that this is what the NC was supposed to be, and not one of the promoters of the NC is making any money on it. And as Intel ponders this turnabout, the company has to be freaked by the fact that this machine runs a non-Intel processor. Intel is scrambling to get into this market along with everyone else.

If a debate breaks out as to whether this new trend marks the end of the computer boom, optimists will say that the foreign market will make up for any shortfall. Besides, they'll say, there is still a booming market for servers. But the foreign market looks as if it is going into a stall, and the market for servers will never match the market for workstations. Worse news for the optimists is the possibility that the entire business market will soon want sub-\$1,000 machines.

Then there is the situation with chip growth. The rule of thumb concerning periods of growth spurts is that the performance of the desktop computer must at least double—perhaps triple—for people to upgrade. This is particularly true for the power users who live at the top of the performance curve and then ride it down. When the Pentium was released at 60 MHz and 66 MHz, the market did not explode, since most people found little difference between a 50-MHz 486 and a 66-MHz Pentium. Most of the growth occurred during the 133-MHz phase. It's no coincidence that things are booming again at 266 MHz. If we move even fur-

ther up the power curve to the screaming 300-MHz machines, we see a new sweet spot for the power user. But once the power users have moved to 300 MHz, when can they expect 800 MHz? There are a number of roadblocks to that change. And with the trend toward sub-\$1,000 machines in

the general market, the likelihood that software bloat will continue unabated is nil; thus, power users won't be pressured to upgrade as rapidly as they have over the past few years.

I also sense a desire to slow down this process, since upgrading has become much more difficult under Windows 95. Each upgrade requires fully reinstalling all software rather than simply plugging in the external drives or running a backup tape. Years ago in the DOS world, upgrading was effortless. But now with the registry and the load of potentially conflicting DLLs jammed into directories all over the disk, very few software programs can be transferred from machine to machine without a huge hassle. Microsoft should have foretold this problem and made approved vendors stuff their DLLs only in their own subdirectories.

Because of this upgrade roadblock, few users want to go through the process more than once every few years, if ever. In large corporations, this just makes it more difficult for individuals to do much customizing on their personal workstations, because of the fear that straggling DLLs will disable the machines and necessitate lengthy support calls. So corporations are

buying less "rogue" software and keeping machines on bare-minimum configurations. This cripples small vendors.

All of these factors—combined with the natural business cycle—do not bode well for the health of the PC business after the 300- to 400-MHz machines have been absorbed and as business transforms its organization toward thin-client PCs running Office 99 and nothing else. A serious slump appears imminent with these trends on the track.

I have no recommendations as to how this can be avoided, because these things can never be avoided. You can only prepare yourself. Or you can ignore the warnings and see what happens. **PC**



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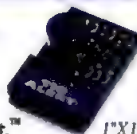
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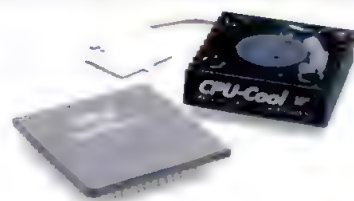
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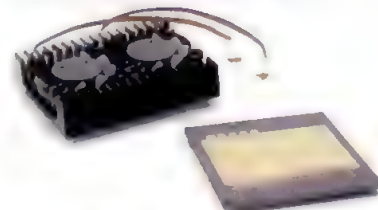
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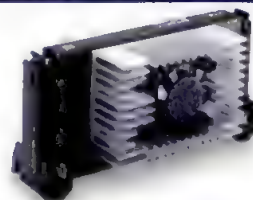


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Inside Track

Toshiba Drops the Infinia Dept.: The Toshiba Infinia was probably the most interesting and **advanced** home PC ever designed. But the company threw in the towel as sub-\$1,000 machines continue to dominate the market. R.I.P.

Cheaper Components Too

Dept.: Just because machines are getting cheaper doesn't mean the end of progress. Everything will simply pause for a moment to catch up to the lower pricing. Hard disks will continue to **cost less** as the latest new technology is used. Over the past few years, IBM has been the most aggressive maker of high-performance disk drives. It's now going onstream with its **GMR** (giant magnetoresistive) head, just as the rest of the industry is fully adopting the plain old MR head. IBM is starting with a small 1-inch-high drive that holds **16.8GB**! This, curiously, has brought a Japanese maker of disk drives into the fray. Toshiba has announced a 2.5-inch, 3.2GB hard disk for laptops. It uses a GMR head that was apparently developed by TDK. According to some reports, the **bottleneck** is now the electronics on the drive, which can't handle the data flow produced with maximal GMR bit density.

This development has caught much of the industry **by surprise**. The change from thin-film heads to MR heads has taken **years longer** than anticipated. *EE Times* has pointed out that Control Data Corp. said it was going to ship high volumes of **MR heads in 1989**, just before the drive division was bought by Seagate. In fact, Seagate did not release the MR-head drive until 1995. More than half the drives shipped in 1997 still use thin-film heads. Getting the MR heads is apparently the problem.

While on the Subject of EE Times Dept.: I was fascinated with a report by Robert Bellinger concerning the National Information Technology Workforce Convocation in Berkeley. It addresses the concept that we are **short on engineers**, or will be soon. A group of engineers believes this is **propaganda and part of a grand scheme** by the U.S. government to **screw the U.S. engineer**. From the article: "Some believe that those trumpeting a shortage [of engineers and programmers] are actually nursing a hidden agenda, one that ultimately involves a deflating of U.S. engineers' salaries and an easing of immigration to allow in thousands of foreign programmers."

Professor Norman Matloff of the University of California at Davis commented that there was no real shortage of programmers; just an occasional shortage of programmers with certain specialized skills. He said this "shortage" is a "smoke-screen hiding increased immigration as the central agenda." Much of this controversy stems from an industry report saying the country doesn't have enough IT workers. Bellinger

*Over the past few years,
IBM has been the most
aggressive maker of high-
performance disk drives.
It's now going onstream
with its GMR head, just as
the rest of the industry is
fully adopting the plain
old MR head.*

points out that **in 1985 there was a similar panic** when the National Science Foundation projected a shortfall of 692,000 bachelor's degrees in the natural sciences and engineering. Four years later, despite the so-called shortfall, there was **record unemployment** of engineers thanks to downsizing. The NSF was humiliated and pretended the report never existed.

This, to me, is part of the globalization of U.S. business and the favoring of **cheaper overseas labor**. This scheme is **doomed to failure**: All it does is create contempt for a corporate American management structure based on greed. In the computer industry, modular programming and component models were promoted in an effort to create overseas coding "factories," which could

make simple modules that would be pieced together in the U.S. by a skeleton crew of quality programmers. I can't tell you how many schemes I've seen involving coders in India, for example. These folks would supposedly code there **for a pittance**, and the code would be beamed by satellite to U.S. headquarters to be assembled. If anyone has actually made this scheme work, they've kept it a **secret**. The failure of U.S. business and the U.S. government to offer adequate protection for our own workforce—the people who buy products and vote—is shameful.

Online Report: I've already discussed the Internet2 proposals, which concern a network to be used in academia and by research sites to guarantee a higher bandwidth. For the citizen Internet user, we can expect to see the **"Super-Net."** At least that's what virtually every telecommunications organization in the world is now working on. This will be a **giant fiber-optic worldwide network**. The first phase will be operational by 2000, and the entire network will be up by 2003, say the optimists. Much of this is part of a **little-discussed development called Project Oxygen**, which is a **\$14 billion undersea cable network** designed to reach a peak speed of (get this) **1 terabit per second**. A New Jersey start-up called CTR is behind much of Project Oxygen.

According to one source, with this project in place the **cost of international voice calls will essentially be zero**. Well, at least after the \$14 billion is paid off. This network will be an IP network, so all phone services will be IP-based, another major trend we are witnessing. The guy behind CTR is responsible for many other world fiber links, including the recently completed FLAG (Fiber-optic Link Around the Globe) initiative: the longest submarine cable in the world. (It's 27,000 km of cable.) Project Oxygen will use more than **270,000 km of cable** and will compete directly with Internet-in-the-sky projects such as Teledesic. Fiber optics is faster and more secure than satellites. **PG**

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PC98: Turning PCs Upside Down

Hey, don't talk about that! And don't *write* about it yet! You'll kill our Christmas sales! Remember Adam Osborne?!" The words changed very little from person to person as I asked PC executives at Comdex in November how soon they would be selling new

machines compliant with the Microsoft PC98 guidelines.

By Comdex, my columns through 1997 were already closed, so they were safe: I couldn't tell you how important the PC98 spec is going to be, how profound the changes in Windows PCs are going to be, beginning later this year. And how much you're going to want one of these machines.

Adam Osborne? Few remember Adam today, but he was once an important figure in the PC industry. His Osborne 1 portable PC, a CP/M system in a suitcase, was big, heavy, ugly, clumsy, and slow, had a terrible keyboard and a tiny monitor—and was quite wonderful, at least for its time (the early 1980s). Yet Adam isn't remembered for that groundbreaking machine but rather for its near-successor, the Osborne Executive—and for the way Adam's premature comments about the Executive destroyed his company almost overnight. The minute Adam started talking about how much better the new Executive would be, sales of the original machine collapsed. Osborne Computer was late with the Executive, and with no revenue from Osborne 1 sales or from the not-quite-ready Executive, the company crashed and burned.

So it's easy to understand why PC execs didn't want me talking about the new PC98 machines until they were close to shipping them. The ghost of Adam Osborne is very much with them. But that's not how the game is played, and I want to alert you right now to how this sea change in PC design and construction will affect you.

PC98 is yet another in the endless list of Microsoft-promulgated PC industry "standards." We've come to look forward—sort of—to Microsoft's arrogant announcements every spring at WinHEC (Windows Hardware Engineering Conference) in San Francisco regarding its latest updated spec for PCs for which it will grant the "Designed for Windows" sticker. Every year Microsoft tells us what we're going to want a year or so hence, then sticks that spec down the industry's throat.

The early specs were ludicrous, led by the hilarious Multimedia PC (MPC) standard Microsoft propounded al-

most a decade ago. It was woefully feeble and out of date by the time MPC-compliant PCs actually appeared, but since then Microsoft has done a better job.

PC98 goes much farther than ever before in challenging our assumptions about what ought to be in a PC. To build support for it, Microsoft invited Intel and Compaq to help write the PC98 spec—which Microsoft says isn't really a spec or a reference design at all but merely a "design guide"—and it grandly lists almost 100 PC hardware designers and makers who contributed ideas for the spec.

A cynic might suggest that Microsoft's "partners" in developing the PC98 document had somewhat less clout than Big Redmond itself did. But wherever the ideas came from, PC98 has turned out to be a rich, appropriate, and enormously important leap forward in computing.

There's many a slip twixt the spec and what ships, of course, and PC98 has its own internal confusion and waffling about just what will be required, and when, in order to get the Microsoft imprimatur. But as a whole, it's a remarkably good and forward-looking spec.

The basics: PC98 machines will be powered by 200-MHz or faster MMX CPUs, will have 32MB or more of memory, will offer USB and FireWire (IEEE 1394) ports, will have 1,024- by 768-pixel or better video with full-screen MPEG-2, and will support UltraDMA/33 hard disks. And much more.

All of which is important, with far-reaching consequences. But none of these changes is the most important one mandated by PC98. That honor is reserved for the end of the ISA bus.

Yes! We're finally getting rid of the slow, clumsy, 14-year-old Industry Standard Architecture bus! We've had the obvious successor available and in wide use for years—the PCI, or Peripheral Connect Interface, bus—but we've continued to pollute PCI-bus PCs with two or more ISA buses. For backward compatibility, of course.

Putting an ISA bus in what is essentially a PCI-based machine screws up everything. We're caught in the ugly web of too few IRQs, for one thing. The ISA bus is *sooo* slow. We



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JIM SEYMOUR

can't reliably plug and play add-in cards and add-on devices in machines with ISA buses, because they're too stupid to detect what's been changed.

Now, with PC98 machines, the ISA bus will finally be history. PC98-compliant machines must replace the ISA bus with a 64-bit, 66-MHz to 100-MHz PCI or AGP bus.

Implementation of this no-ISA-slots requirement is one of the waffle points in PC98, unfortunately. Though most of the important PC98 specs kick in on machines submitted to Microsoft for testing as of July 1, 1998, Microsoft will give hardware makers another six months to dump ISA. So we may see six months or so of half-witted designs coming to market—if hardware vendors are that foolish.

I could go on for several hours about the importance of PC98. There isn't space here for a full discussion of PC98's impact, or even for a complete listing of its components. Microsoft has made the spec even harder to explain (but easier to understand) by dividing it into several subspecs for desktop, mobile, and home-entertainment machines. You can get a copy of the full spec, plus lots more supporting information, from www.microsoft.com/hwdev/ver4/pc98.htm or developer.intel.com/design/PC98/Sessions/Microsoft.

This spec not only serves Microsoft's self-interest by mandating a class of machines ideally suited for Windows 98 and Windows NT 5.0 but also creates the kind of machines we've needed for years. It also raises serious issues for the under-\$1,000 PC market and for build-to-order direct marketers.

I think full compliance with PC98 should be a part of every PC buying decision, personal or corporate, in 1998—starting today.

When will we see these wonders? NEC, the first to sign up, announced its new PC98 NX line in October. With the Christmas selling season over, other vendors will be announcing PC98 machines very soon, they tell me—though not necessarily delivering them until the middle of the year. Will they be fully compliant, ISA-less boxes? Vendors won't say. Change, they keep reminding me, cost\$.

And trapped in a market in love with \$1,000 PCs and \$2,000 Pentium II PCs, vendors don't want to bear those costs any sooner than necessary. I expect PC98 boxes will not carry premium prices for long, if at all.

What if you just bought a new PC? It'll work fine for years to come—but I have to tell you that you'll be sorely tempted by fully compliant PC98 machines. *Ouch.* **PC**

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Integration or Segregation?

Microsoft is like a fraternity house. Individually, the people are intelligent, witty, high-spirited folks you wouldn't mind meeting over dinner. But get a couple of drinks—or stock options—into them and as a group they become rowdy and overbearing.

Things can turn ugly fast.

This is real life, however, and it isn't just the dean of student affairs who's annoyed by *Animal House* hijinks, it's Janet Reno and the Justice Department. And it isn't just 20 hours of community service they're looking to extract from the Redmond *Animal House* gang: Justice wants Internet Explorer unbundled from the Windows operating system.

Ultimately, I believe Microsoft won't be forced to unbundle IE and Windows, even though a federal judge in December ordered Microsoft to unlink sales of the two to PC makers temporarily. Here's why I believe Microsoft will prevail:

Microsoft has better lawyers than the government. Microsoft negotiated a 1995 consent decree that allows it to "enhance" the Windows operating system. That gives Microsoft a lot of wiggle room. It looks as if Justice is now saying, "Um, we didn't mean you should enhance it *that* much."

The OS and the Internet are getting closer. Right now when you click to browse a file and it takes 90 seconds to come up, you can bet it's out on the Internet. That's not what I'd call seamless. But that difference will go away with high-speed connections. If so, it makes sense for the operating system to have Internet features. Conversely, as HTML has become a popular format for storing files on local hard disks, why shouldn't the OS be able to browse and manipulate those local files?

Netscape played into Microsoft's hand. Netscape made noises about turning Navigator into something akin to an operating system. If your number-one competitor moves into your turf, maybe the logical thing to do is move into the competitor's turf.

Microsoft isn't a big fish in every pond. Microsoft dominates the software side of the industry. But as Microsoft has tried to move into online commerce and television, it's run into some feisty competitors every bit as big. (Note how little success Microsoft and the rest of the PC industry have had telling the networks and TV manufacturers which HDTV specs to use.)

The customers are winning. The browser wars are pro-

viding great new software, updated frequently, with more and mostly better features, for free or virtually for free. What's so bad about that?

Although I believe Microsoft will ultimately prevail and keep Internet Explorer as part of its Windows operating system, I'm not entirely happy with the current state of affairs with respect to the inclusion of Microsoft apps in the OS. I dislike how Microsoft Fax is seemingly embedded in every nook and cranny of your PC. Ditto for Outlook, Exchange, and the Microsoft Network. Either you can't easily remove them from your PC or you're afraid that if you do, you'll louse up the whole OS. So you leave them installed but unused, figuring disk space is cheap and plentiful.

If Justice wants to make Microsoft uncomfortable, why not ask PC vendors why Microsoft software bundles seem to be cheaper to license when they include Microsoft Money—the perennial bridesmaid to Intuit's Quicken, although they're getting closer—in addition to Microsoft Office or Microsoft Works? You'd think you'd pay more as you get more Microsoft software.

Or ask why Microsoft gives PC vendors a hard time when they bundle both Netscape Navigator and Internet Explorer. One PC vendor wanted to sell PCs to Microsoft for Microsoft's own use. Microsoft verified that IE was included. Then Microsoft said it wasn't happy that Navigator was also on the vendor's PCs.

No problem, we'll take it off the PCs we ship you, the vendor responded. No, the vendor was told: Microsoft was unhappy that the vendor was shipping Navigator on *any* PCs it sold.

All this back-and-forth isn't going to unearth anything that will hang Microsoft out to dry in court, in my opinion. Microsoft doesn't always play fair, but *unfair* isn't a synonym for *illegal*. And if there is uncertainty about which way the courts should go, I believe the tie has to go with the runner—in this case, Microsoft.

What's happening here is no different from attaching barnacles to the bottom of a fast boat. In a race, it doesn't make the other boats any faster; it just slows down the leader. **PC**



END RUN
Ultimately, I believe Microsoft won't be forced to unbundle IE and Windows.

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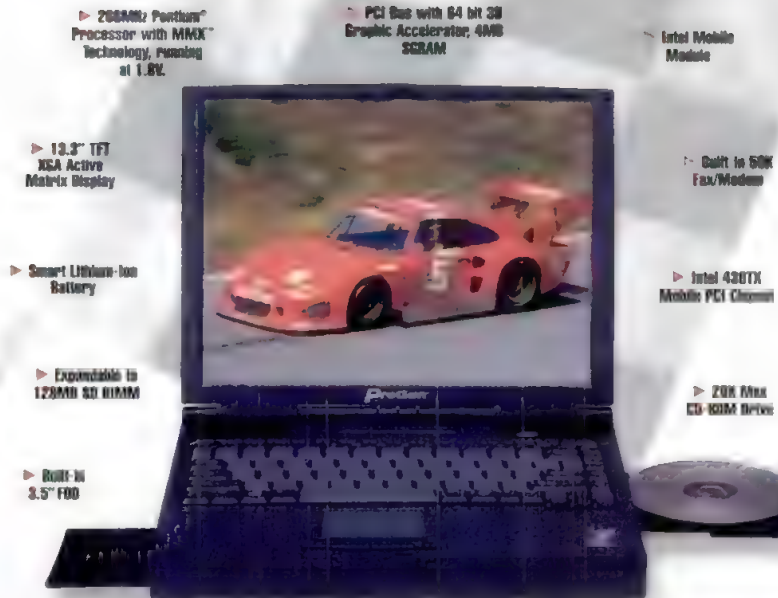


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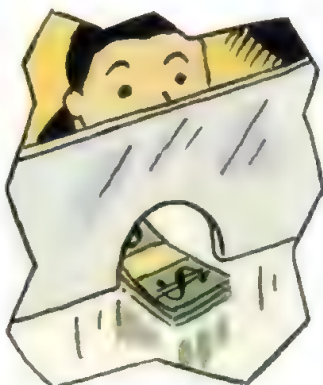
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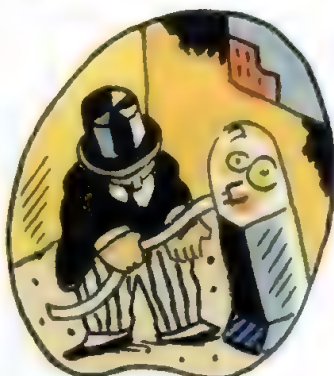
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103 DESKTOP FINANCE: MONEY 98 VS. QUICKEN 98 • 129 ONLINE FINANCE

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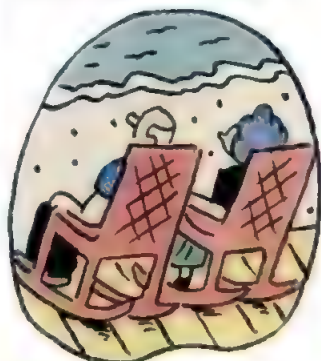
PAYING BILLS

Your gas bill always gets paid with Money or Quicken. You can set up recurring electronic transfers, get reminders of due dates, and print out checks and pay bills online. *Page 110.*



HOME BUYING

Finding your dream house and figuring out how to pay for it are easier using the Web. Interactive tools help you decide how much house you can afford. You can prequalify for a loan, and real-estate listings abound. *Pages 120, 129, 140.*



RETIREMENT

Money and Quicken both offer excellent long-term planning tools, and the Web is rich with data about 401(k) and other plans for making those years golden. *Pages 127, 129, 134.*



ONLINE TRADING

You always knew you were smarter than your broker. Prove it by making trades yourself on the Web. And you can use Money or Quicken to keep track of transactions. *Pages 112, 146.*



TAX PREPARATION

Get forms, information, and return estimates online or through Money or Quicken. Then export that data into tax software. *Pages 120, 136, 287.*



ESSENTIAL INTERNET SERVICES • 287 TAX SOFTWARE: TAMING THE 1040

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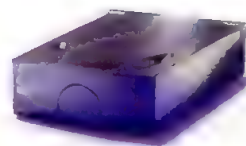


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DESKTOP FINANCE

Money 98

VS.

Quicken 98



Two titans of personal finance software, Microsoft and Intuit, are battling for the right to manage your money. *By Kathy Yakal*

\$ince our last review about a year ago, the personal finance software market has become more consolidated. What was a crowded field a few years ago has dwindled, leaving two major players. But this should not be interpreted as a sign that the market for personal finance software is stagnant. In fact, the opposite is true. The two products we review, Microsoft Money 98 Financial Suite (\$50 street) and Intuit's Quicken Deluxe 98 (\$60 street), push personal finance software to new heights of innovation and functionality.

Personal finance is one of the very few categories in which Microsoft could still be regarded as an underdog,

although the latest version of Money should change this perception. A completely revamped program, Money 98 features a striking streamlined Web-style interface. Combined with an array of new features, these changes have transformed Money into a serious competitor of Quicken, the longtime leader in the personal finance arena.

After giving Quicken a complete remodeling last year, Intuit has maintained the basic design in Quicken 98. A row of large icons at the bottom on the screen lead to pop-up menus that provide access to the most commonly used functions. Both programs are generally easy to use, but we think most users will prefer Quicken's tried-and-true checkbook-style register over Money's

FINDING THE RIGHT FIT FOR YOUR FINANCES

With only two major vendors dominating the market for personal financial software, you'd think it would be easy to choose a product. But Microsoft's and Intuit's product lines can be confusing. This table will help you find the product that meets your personal and small-business needs.—Yvonne Koulouthros

Microsoft Corp.

Redmond, WA; 800-426-9400, 425-882-8080;
fax, 425-936-7329; www.microsoft.com.

Microsoft Money 98 Financial Suite

An all-in-one solution, this suite helps you take charge of nearly any financial task. This version, which also comes with tax and mortgage information, is reviewed in this story. Street price: \$50; competitive upgrade, \$35. Requires: 486-based PC or better, 12MB–16MB RAM, 25MB–55MB hard disk space, Microsoft Windows 95 or NT 4.0. Choose 513 at www.pcmag.com/infolink.



Microsoft Money 98

Microsoft's base product addresses basic financial tasks: paying bills online, budgeting, and investing. Also bundled with PCs and offered in banks' online checking packages. Street price: \$25; competitive upgrade, \$15.



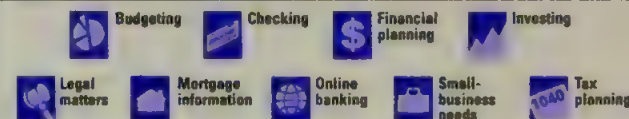
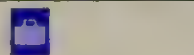
Microsoft Home Essentials 98

Home Essentials includes Money 98 plus a suite of home software including Microsoft Word 97, Encarta 98, Works 4.5, Greetings Workshop 2.0, Internet Explorer, and The Entertainment Pack Puzzle Collection. Street price: \$100.



Microsoft Office Small Business Edition

This suite includes Small Business Financial Manager for Microsoft Excel 97, which lets Excel users analyze accounting data. Also includes Microsoft Word, Excel, Outlook, Publisher, Expedia Streets, and MSN. Street price: \$500; upgrade, \$210; competitive upgrade, \$250.



Intuit Inc.

Mountain View, CA; 800-446-8848, 650-944-6000;
fax, 650-322-1597; www.quicken.com.

Quicken Deluxe 98

In addition to the basics, Deluxe provides information on mortgages and planning. This version is reviewed in this story. Street price: \$60; upgrade, \$40. Requires: 486-based PC or better; 8MB RAM; 35MB–41MB hard disk space; Microsoft Windows 95, NT, or 3.1. Choose 512 at www.pcmag.com/infolink.



Quicken Basic 98

Intuit's entry-level product lets you balance your checkbook, pay your bills online, and see where your money and investments are going. This version is also bundled with PCs, and offered in banking software. Street price: \$40; upgrade, \$30.



Quicken Suite 98

This comprehensive pack comes with Quicken Deluxe as well as Quicken Financial Planner 3.0 and Quicken Family Lawyer Deluxe. Street price: \$90; upgrade, \$70.



Quicken Home & Business 98

Think of this package as Quicken Deluxe, plus features for small business—such as invoices and business reports as well as tracking of reimbursable expenses. Street price: \$90; upgrade, \$70.



BankNOW

If you just want to keep tabs on day-to-day expenses and pay bills electronically, you don't even need software. Intuit's free service can take care of these tasks for you. Free online.



more stylized approach. And although its interface doesn't look as sophisticated as Money's, Quicken is every bit as modern in its approach to managing money—making the selection of our Editors' Choice especially tough this year.

PROS OF PC FINANCE

For the millions of loyal Money and Quicken users, the advantages of using your PC to manage your money seem obvious. But new users or those who haven't upgraded in a while will discover that the latest versions of Money and Quicken have a lot to offer. Far beyond the electronic checkbooks that established the niche, these products are financial suites that help users manage all aspects of personal finance. And both programs har-

ness the power of the Internet effectively to keep your financial picture up to date.

Personal finance software saves you time by automating many of the repetitive tasks involved with money management.

Wizards simplify chores such as setting up new accounts, entering paychecks, and tracking deductions. Rather than writing a mortgage check each month, you can schedule recurring payments and let the program do the work.

And if you set up an online account with one of Money's or Quicken's many banking partners, you can download statements and pay bills online.

In addition to day-to-day financial activ-

ities, personal finance software can help with longer-term investments. For example, Money and Quicken can manage your portfolio of stocks or mutual funds—or your 401(k) account—and to track perfor-

mance, you can tap into their companion Web sites, Microsoft Investor and Quicken.com. You can receive news related to securities you own and download statements from major brokerages automati-

cally. New Internet features can also save you money on other financial services. For example, you can shop for better deals on mortgages and insurance.

Perhaps the biggest payback of using personal finance software is that you can take advantage of the data you've accumulated to analyze your situation and plan for the future. Because Money and Quicken categorize income and expenses, you'll be better able to track where your money

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Visit our Web site and take an interactive quiz to gauge whether your finances are in peak condition. You'll also find interactive views of this story and links to financial resources on the Web.

Our Contributors: KATHY YAKAL is a frequent contributor to *PC Magazine*. WILL FASTIE and MICHAEL L. SCHNEIDER are freelance writers, and YVONNE KOULOUTHROS is a staff editor of *PC Magazine*. DIANE JECKER was the project leader, and JOHN MORRIS was the associate editor in charge of this story.

comes from and, more important, where it goes. To help you get out of the red, both packages offer debt-reduction tools. Other tools help you plan for major events such as college or retirement, or help you prepare for financial emergencies.

To cover these many areas, we've divided the story into five key categories. Although the two products were neck and neck in nearly every task, Quicken came out on top in four categories: Getting Started, Managing Accounts and Paying Bills, Investing, and Other Financial Services. In our final category, Planning for the Future, Money held a clear edge with its powerful budgeting, reporting, and analysis features.

Microsoft is giving Intuit a run for its money. But Quicken remains the more powerful and comprehensive package.

GETTING STARTED

ALL REVIEWS BY KATHY YAKAL

If there's one job more tedious than keeping track of your money, it's setting up the bookkeeping system in the first place. Fortunately, both Money and Quicken make the process relatively painless, and you shouldn't have much trouble establishing a new framework for your personal finances.

The first thing you'll notice about Money is that it doesn't look like an application at all. Instead, the HTML-based interface looks like a Web page and relies

Editors' Choice

• Quicken Deluxe 98



For the first time, the two-horse race between Money and Quicken is a photo finish. Microsoft Money 98 Financial Suite is a strong competitor

with an innovative Web-based interface and excellent planning tools. But Intuit's Quicken Deluxe 98, a more functional but less ambitious upgrade than last year's version, held on to retain its lead in the personal finance market and win our Editors' Choice.

Although we liked Money's new interface, Quicken's checkbook-based register is still a better solution. Quicken supports online banking and bill payment through more than 50 banks and allows you to download statements from major credit card companies and brokerage houses. We also liked the way Intuit embedded the Microsoft

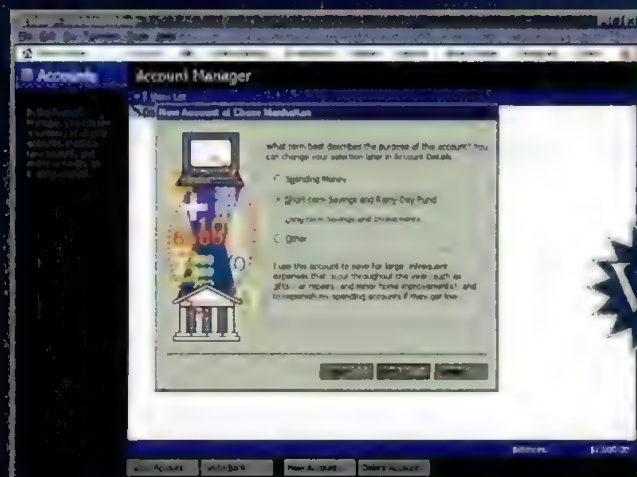
Internet Explorer browser directly into Quicken's interface, letting you move seamlessly between the program and the online resources. Quicken is backed by the best overall Web site for personal financial management, Quicken.com, and online tools such as Quicken Mortgage and InsureMarket give this site the edge over Microsoft Money Insider. In addition, though the \$9.95-a-month Microsoft Investor comes with better investor resources, Quicken.com's services are free. Although Quicken could improve its planning features somewhat, it remains the best choice for managing your personal finances on the PC.

on the single-click metaphor familiar to anyone who has used a Web browser. The effective Financial Home Page provides a snapshot of your financial situation—including current account balances, upcoming bills, news, and personalized advice. After giving Quicken a whole new

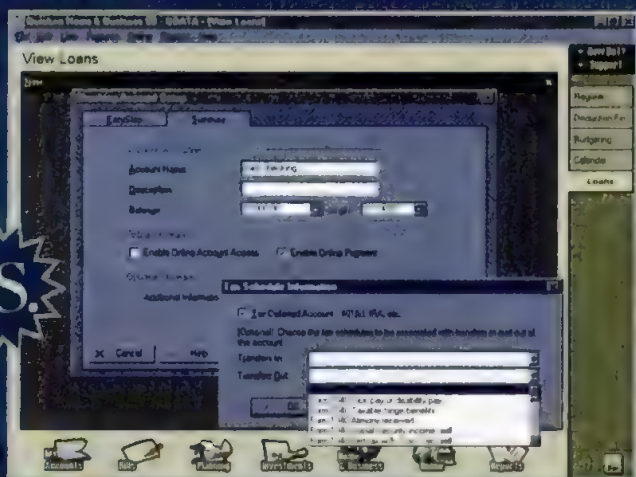
look and feel last year, Intuit left the interface essentially unchanged in this version.

As the programs have evolved, so have their setup procedures. Wizards simplify the process of creating accounts. If you already have data collected in a format that these programs can import, such as

GETTING STARTED



MONEY'S ACCOUNT MANAGER lets you specify the purpose of accounts at the time of setup.

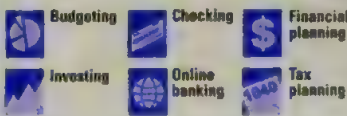


IN QUICKEN, you set up a new account by entering information about your online status and tax schedules.

CARVING A NEW NICHE IN FINANCE

Intuit and Microsoft dominate the personal finance software market. Nevertheless, a handful of retail and shareware products continue to serve specific needs.

Just a few years ago, our roundup of personal finance software might have contained as many as ten products, but Intuit and Microsoft have left little room for the competition. MECA's once-popular Managing Your Money is no longer sold retail. Instead, it is sold through banks as a front end to their proprietary online banking software. MoneyCounts, from Parsons Technology, has found a new market. Part of an \$89 bundle that also includes Parsons' church management software, MoneyCounts is now targeted at nonprofit groups and is distributed by Broderbund. Only two retail contenders remain, and neither competes directly with Money or Quicken. The shareware market, by contrast, is teeming with low-cost alternatives. We narrowed our selection to 32-bit programs that can handle checkbook duties. Most are available on multiple sites for 30- to 90-day evaluations. The appeal of these shareware products lies in their simplicity. And you can't beat the prices.—Will Fautie



RETAIL PRODUCTS

Simply Money 2.1.
Street price: \$10. CD Titles Inc., Waltham, MA; www.cdtitles.com.



Formerly owned by Computer Associates, Simply Money is a comprehensive but dated package. It has not been updated since our review two years ago ("Personal Finance: Banking on Your PC," January 23, 1996). Now distributed through supermarkets and retail stores for \$10, Simply Money integrates with Simply Tax (\$10), which has been updated.

Smart Home Manager 2.0.
Street price: \$40. Surado Solutions Inc., Riverside, CA; www.surado.com.



Smart Home Manager, a comprehensive product focused on home finances, is set apart by its extensive information management features—from an address book to a wine list. Smart Home Manager also includes a calendar and extensive reports. Since our most recent review ("Making Your Money Make Money," January 21, 1997), Surado Solutions has enhanced the interface.

SHAREWARE PRODUCTS

ChequeBook 95 5.0.
Street price: \$20. Smartware Developments, Grimsby, Ontario, Canada; www.winsite.com.



ChequeBook 95, a straightforward account management program, supports many account types including checking, credit cards, and loans. The product uses cumbersome codes for categories, and the interface is a bit rough, but the right-click menus provide access to helpful options. It requires Visual Basic 4 runtimes.

Make\$.Cents 1.3.
Street price: \$30. Empower Software LLC, Lindon, UT; www.empowers.com.



A powerful and flexible envelope budgeting system, Make\$.Cents displays information—especially the account list—in a clear, uncluttered manner. The simple user interface belies the underlying capabilities of this product.

Money Smith 95.
Street price: \$30. Money Smith Systems Inc., Converse, TX; www.nmia.com/~monsmith.



Money Smith 95, a reasonably powerful accounting program, offers good reports. Its unusual user interface requires some practice. Although the product is intended for home use, Money Smith 95 has the look and feel of an accounting program. It includes an excellent standalone financial calculator.

Monthly Bill Manager 98.
Street price: \$40. MJK Software Writers, Weston, FL; www.mjksw.com.



Based on the envelope budgeting system, Monthly Bill Manager has a contemporary, Microsoft Office-like user interface. Data entry and navigation can be awkward at first but go much faster once you learn the program's conventions. Bill Manager is an intelligent and carefully crafted product with potential.

.QIF (Quicken Interchange Format), transferring the data is easy.

The data-import abilities of Money and Quicken are similar, but some differences are worth mentioning. Capable as Money is, its import function does not offer as many options as Quicken's. Money and Quicken each offer a simple import dialog box. But within Quicken, once you've selected your .QIF file and destination account, you can select the elements of the file that you want to import: accounts, memo-rized transactions, transactions, and categories. Money offers a Converter wizard for Quicken

to help you pull data directly from Quicken. You can also select the file you want to import and the destination account in the dialog box.

During the account-setup procedure, Money is especially thorough. The program asks detailed questions early on that, although time-consuming, are well

worth your while, because they help tailor Money to your needs. Setting up basic accounts such as checking and cash is straightforward. A wizard asks for basic information (institution, account number, and balance) and drops those details into the Account Manager. Other account types such as credit cards and investments require more input. And when you create an asset account (such as one for a home) you can choose to link the new account to a loan.

Although Quicken's account setup is no more difficult to use, the procedure is not as thorough. In general, the program does not request as much information during setup. One area where Quicken does excel, though, is paycheck setup. Its EasyStep wizard is more effective than Money's solution for establishing your income and deductions—including 401(k) contributions.

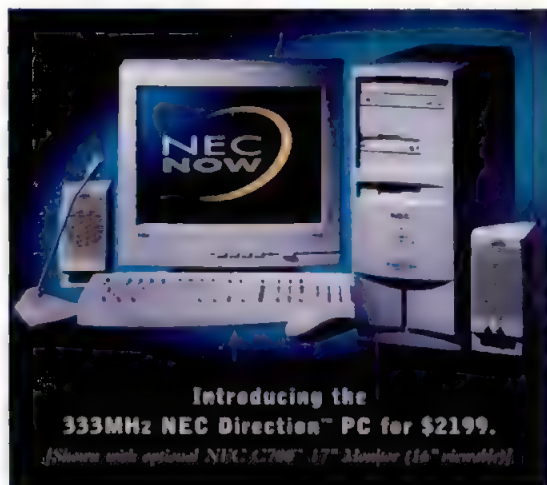
Online banking can be a real time-

GETTING STARTED

	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
	Power/Ease	Power/Ease
Data import	Good/Excellent	Excellent/Excellent
Account setup	Excellent/Excellent	Good/Excellent
Online banking setup	Good/Excellent	Good/Excellent
Other online bill payment options	Excellent/Good	Excellent/Excellent

Data import refers to the program's ability to accept existing financial data in industry-standard formats, and **account setup** refers to the program's ability to create and link various account types. **Online banking setup** relates to the program's ability to supply an efficient link to the Web, to set up relationships with an adequate number of financial institutions, to establish online accounts, and to determine alternative bill-paying options. **Other online bill payment options** involves the program's ability to use third-party services for online banking.

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- 64MB SDRAM Memory
- 4.3GB Ultra DMA Hard Drive
- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality 334 AGP, 4MB SGRAM Graphics Card
- Altec Lansing ACS-90 Speakers
- 24X max Variable Speed CD-ROM
- U.S. Robotics x2 56Kbps* Winmodem
- * Upgrade to 128MB SDRAM Memory, add \$179
- * Upgrade to 6.4GB Ultra DMA Hard Drive, add \$89
- * Upgrade to NEC C700 17" Monitor (16" viewable), add \$199
- * Upgrade to Number Nine Revolution 3D AGP, 4MB WRAM Graphics Card, add \$149

\$1699

Consumer Lease: \$67/mo. Code #D5068

Direction 233L

- 233MHz Pentium II processor
- 64MB SDRAM Memory
- 3.2GB Ultra DMA Hard Drive
- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality 334 AGP, 4MB SGRAM Graphics Card
- Altec Lansing ACS-90 Speakers
- 24X max Variable Speed CD-ROM
- U.S. Robotics x2 56Kbps* Winmodem
- * Upgrade to 128MB SDRAM Memory, add \$179
- * Upgrade to 4.3GB Ultra DMA Hard Drive, add \$49
- * Upgrade to NEC C700 17" Monitor (16" viewable), add \$199
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Versa 5080X

- 233MHz Pentium processor with MMX™ technology
- 13.3" XGA Active-Matrix TFT Color Display
- 32MB EDO DRAM (80MB max)
- 512KB L2 Pipeline Burst Cache
- 2.1GB Hard Drive
- Modular UltraSlim VersaBay with Warm-Swap Technology Accepts 20X max Variable Speed CD-ROM, 1.44MB Floppy Drive and Weight Saving Module (all included)
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- * NEC Xircom 10/100 CardBus Network Card, add \$159
- * Upgrade to UltraCare Extended Service, add \$99

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Business Lease: \$133/mo. Code #V5083

Versa 5060X

- 166MHz Pentium processor with MMX™ technology
- 13.3" XGA Active-Matrix TFT Color Display
- 32MB EDO DRAM (80MB max)
- 256KB L2 Pipeline Burst Cache
- 2.1GB Hard Drive
- Modular UltraSlim VersaBay with Warm-Swap Technology Accepts 20X max Variable Speed CD-ROM, 1.44MB Floppy Drive and Weight Saving Module (all included)
- * Upgrade to 64MB RAM, add \$299
- * U.S. Robotics x2 XJACK™ 56Kbps* Modem, add \$159
- * Versa PortBar™ 5000 with 10Base-T, add \$249

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Business Lease: \$118/mo. Code #V5061M01

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Versa 2785MT

- 233MHz Pentium processor with MMX™ technology
- 12.1" SVGA Active-Matrix TFT Color Display
- 32MB EDO DRAM (128MB max)
- 512KB L2 Pipeline Burst Cache
- Built-in 2.1GB Hard Drive, 20X max Variable Speed CD-ROM, 1.44MB Floppy Drive, and Lithium Ion Battery
- Microsoft Office 97 Small Business Edition
- Microsoft IntelliMouse
- * Upgrade to 64MB RAM, add \$299
- * NEC Xircom 10Base-T Network Card, add \$99
- * PowerXtender Airplane and Auto Adapter, add \$89

\$2999

Business Lease: \$111/mo. Code #V2715M19

Versa 2765MT

- 166MHz Pentium processor with MMX™ technology
- 12.1" SVGA Active-Matrix TFT Color Display
- 32MB EDO DRAM (128MB max)
- 256KB L2 Pipeline Burst Cache
- Built-in 2.1GB Hard Drive, 16X max Variable Speed CD-ROM, 1.44MB Floppy Drive, and Lithium Ion Battery
- Microsoft Office 97 Small Business Edition
- Microsoft IntelliMouse
- * Upgrade to 64MB RAM, add \$299
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saver, but first you must set up an online account. At their Web sites, both Money and Quicken provide update information on their banking partners. Although Quicken gives you a list of eligible financial institutions, Money requires that you enter the name of a bank. But once you do this, Money displays a more thorough description of services and prices. With both programs, you must apply for an online account to the bank itself, which will take time and some paperwork. Then you should be up and running quickly whether you use Money or Quicken, thanks to their setup wizards.

MANAGING ACCOUNTS AND PAYING BILLS

The heart of all personal finance software is the personal account manager, or check register. Users spend much of their time in this critical area. Both Money and Quicken provide effective tools to keep accounts up to date and make payments either online or by printing checks. But Quicken's familiar account register has withstood the test of time and, combined with the program's new features, gives the program the edge in this category.

Quicken's bill-paying functions are placed logically in a single Bills menu—except for CheckFree, which is handled separately. You can also pay bills from the

check register (My Accounts). Intuit introduced a set of function-related icons in Quicken 6 that continue to be effective devices. Click on any of the icons located at the lower edge of the screen (My Accounts, Planning, Online, and so on) and a small, context-sensitive menu appears and displays your options.

The first option takes you to a screen that displays the checks to be printed. Another option opens the online payment center, where you can enter electronic transactions and download account information. The Repeating button lets your transaction occur regularly with no further intervention. The account register retains Quicken's trademark checkbook metaphor, which makes tasks such as paying bills and reconciling accounts easy even for novices.

Another menu item takes you to Quicken's graphical Financial Calendar, which displays upcoming bills. You can schedule transactions here too, by dragging and dropping them on the appropriate days.

Like Quicken, Money allows you to pay bills from Accounts or the Bills area. To

make an individual payment, you click on Accounts, make your selection, and go to it. You can also add accounts to the Favorites menu. Below the register area is a small dialog box where you enter transactions and indicate whether to print a check or make the payment online. A wizard (under Bills) helps you set up recurring

MANAGING ACCOUNTS AND PAYING BILLS

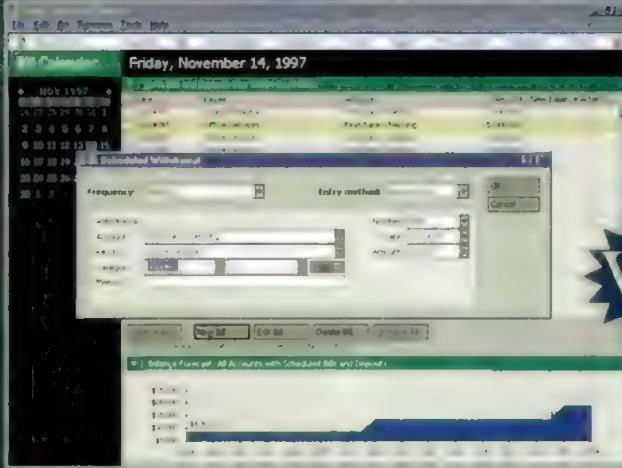
	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
	Power/Ease	Power/Ease
Regular and scheduled transactions	Good/Good	Excellent/Excellent
Online transactions	Good/Excellent	Good/Excellent
Account reconciliation	Excellent/Excellent	Excellent/Excellent
Bill reminders	Fair/Good	Excellent/Excellent

The program's flexibility in handling check writing and in entering register transactions falls under the category of **regular and scheduled transactions**. **Online transactions** refers to the program's dexterity in handling similar check register payments electronically via the Internet. Under **account reconciliation** we evaluate the program's ability to mark cleared transactions and reconcile accounts easily, and **bill reminders** reflects the program's ease in notifying the user of repetitive transactions.

transactions, and you can request reminders, authorize scheduled payments, and allow automatic withdrawals (if your bank supports this).

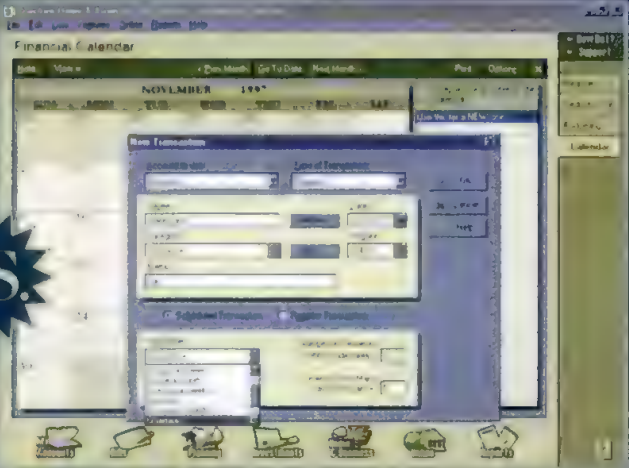
Paying bills isn't much fun, but Money makes the process easy. Queue up a series of transactions, click Online Banking, and select the desired account and Money makes a connection. While you're connected, your bank fires back a list of transactions that have cleared since your last session. You can review and approve them before committing them to your register.

MANAGING ACCOUNTS AND PAYING BILLS



MONEY handles recurring transactions separately from one-time transactions.

VS.



IN QUICKEN, recurring payments appear on the program's Financial Calendar automatically.



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A new feature in Money that serves a similar function is Advisor FYI. It monitors your financial information and alerts you if, for example, you're spending more than you earn or you're not saving enough to meet long-term goals. Quicken.com offers the best content, but it does not provide the same level of interaction with Quicken.

The Internet has had a major impact on personal finance software, especially in the key category of investing. Money and Quicken rely on links to Microsoft Investor and Quicken.com, respectively, to update portfolio information, deliver quotes and news on holdings and on the market in general, and identify new investment opportunities. In addition to being able to execute trades online, you can download statements from select brokerages. And you can create

This year, Money is boosted by the arrival of Microsoft Investor, a newcomer that has quickly made its mark as one of the top-rated sites for inventing. (For more information, see the reviews in this issue's "Essential Internet Services.") By contrast,

	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
	Power/Ease	Power/Ease
Portfolio management	Good/Good	Excellent/Good
Standard and custom portfolio views	Good/Good	Excellent/Excellent
Online quotes/news*	Good/Good	Fair/Good
Online screening/interactive tools*	Excellent/Excellent	Good/Excellent

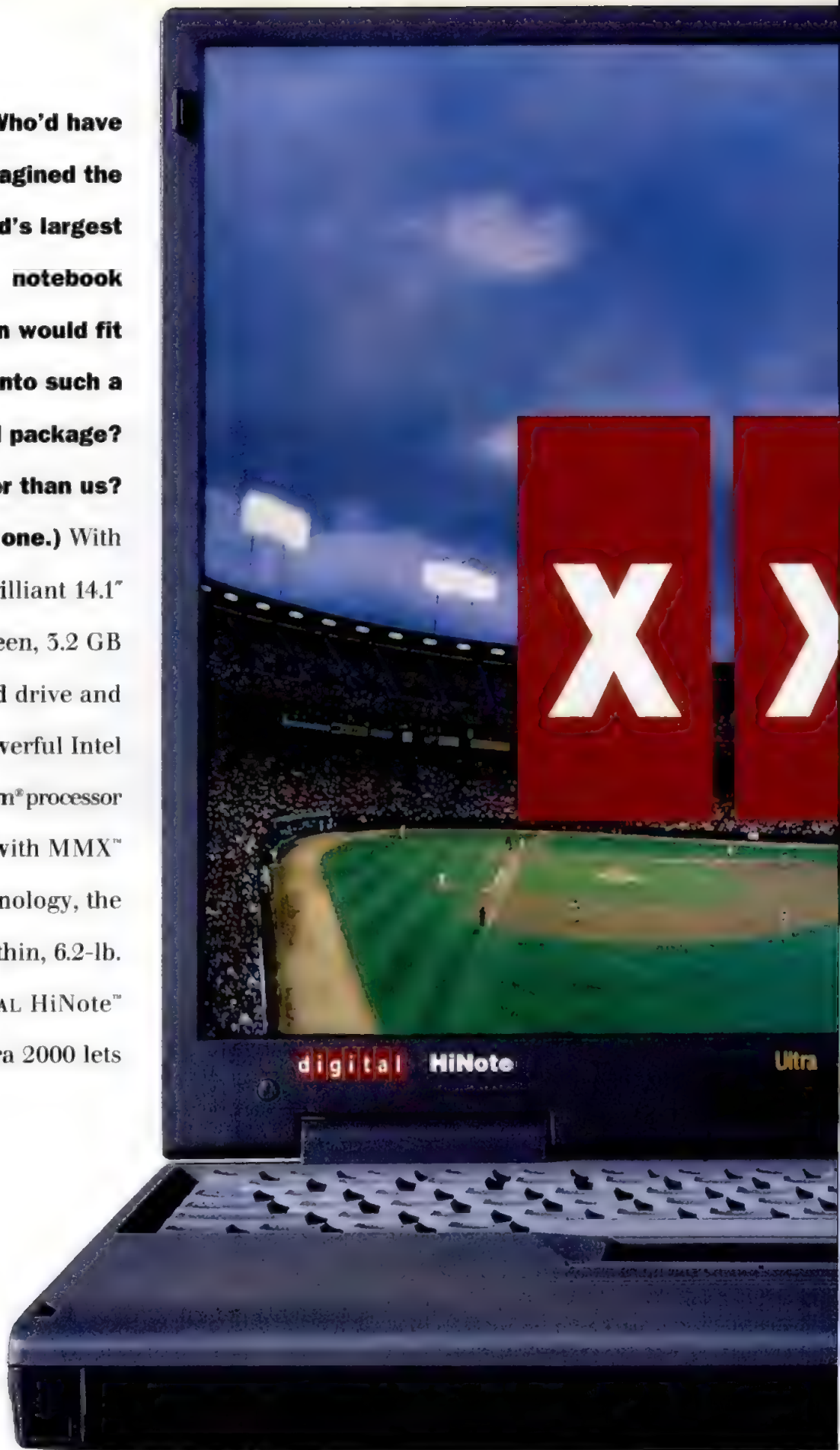
* These categories include both free and subscription based sites. Microsoft's Money Insider and Intuit's Quicken.com are free services. Microsoft investor costs \$9.95 a month, but Money 98 Financial Suite users receive six months of Investor free.

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Banking on a New Internet Standard

The Open Financial Exchange (OFX) specification defines the electronic exchange of financial data between financial institutions, businesses, and consumers. Intuit and Microsoft joined forces with Check-Free, the leader in electronic billing, to develop this specification, which was first released in early 1997.

Designed to supersede current proprietary interfaces, OFX operates via the Internet through Web sites that allow financial transactions, thin clients, and personal financial software. OFX performs financial functions such as electronic banking, bill payment, and investments. In the future, OFX will include services such as financial planning and insurance.

Intuit's and Microsoft's lines of personal and small-business financial

packages are already OFX-enabled. Financial institutions have been slow to adopt OFX technology, however, so Money and Quicken still rely on their own banking partners for online transactions. The OFX standard will allow personal financial packages to communicate with any financial institution in exactly the same way that banks now do. In theory, a single OFX-enabled client could bring together all your financial accounts and related transactions at the touch of a button.

The OFX uses a client/server, request/response model. The client uses a standard HTTP connection to communicate with an OFX server. A message sent by either the client or server contains tags that define the type of message and its information content. Public key encryption ensures

a highly flexible form of security. Since the information within a message is limited to alphanumeric characters, OFX achieves operating system and hardware portability. And with this syntax, you don't have to update client software to process information provided by the financial institution.

Currently, few institutions have implemented an OFX server, primarily because many of the servers have yet to be released. The design of many of these servers involves transferring information from a mainframe to an OFX server. Then the server presents this information to the customer. Whether this three-tier solution will support the millions of users of consumer and small-business financial packages remains to be seen.—*Michael L. Schneider*

Quicken.com is an excellent general personal finance site but also offers a good set of resources for investing. And Quicken offers new investment features such as Portfolio Views and a wizard for setting up 401(k) accounts.

Each program assists you in setting up portfolios of your securities and then

updates their prices automatically when you connect to the Internet. You can record several types of actions, from simple buys and sells to capital gains distributions and stock splits. Several portfolio views let you size up your securities in a number of ways, and capable lot-tracking in both products helps you monitor a par-

ticular block of shares that you own.

To avoid the work of entering transactions by hand or updating your account when the quarterly statement arrives, you can select one of the brokerages that can download information directly to your application. Both programs currently support Charles Schwab and E*Trade Secu-

INVESTING

The image shows a side-by-side comparison of two investment research interfaces. On the left is the Microsoft Investor interface, which features a 'Find' section with a list of securities and a 'Selected Criteria' section. On the right is the Quicken.com Stock Search interface, which features a 'Stock Search Criteria' section with various filters and a 'Submit search' button. A large 'VS.' graphic is placed between the two interfaces. Below the interfaces, there is a caption for each.

MICROSOFT INVESTOR offers a wealth of data, articles, and tools, such as this security screening utility.

QUICKEN.COM's Stock Search helps you target potential investments.

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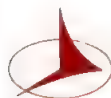
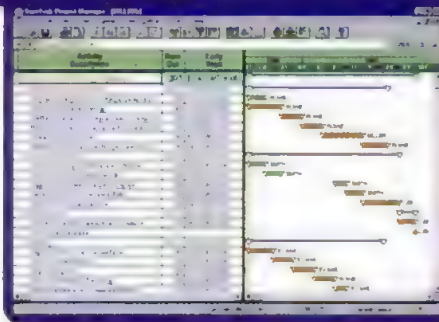
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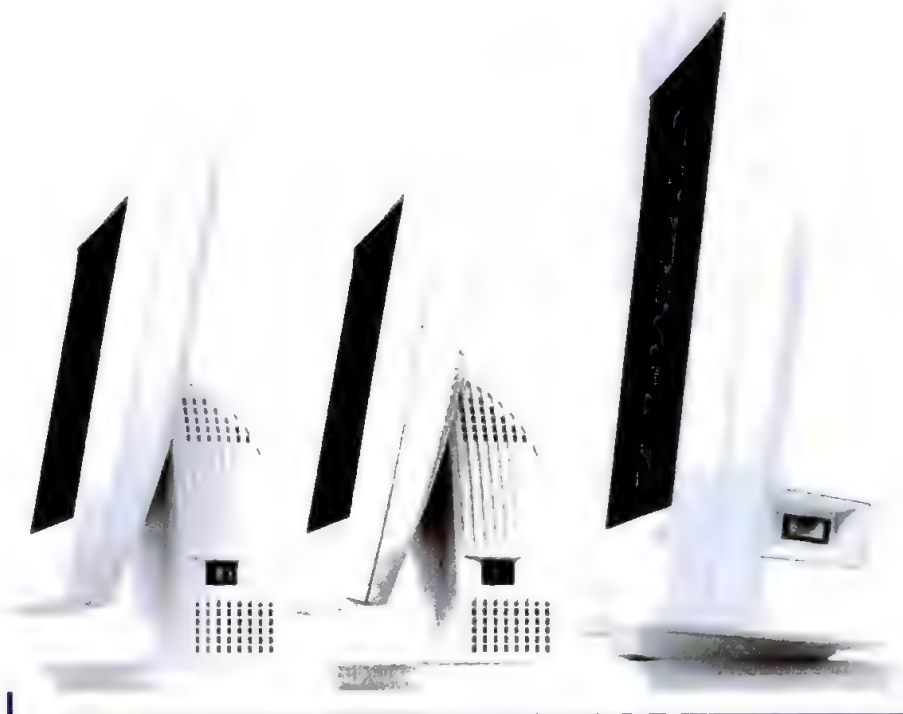


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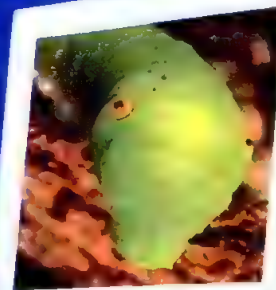
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Maximum Resolution	1024 x 768	1024 x 768	1280 x 1024
Weight	11.0 lbs	11.5 lbs	22.0 lbs
Dimensions (w x h x d)	14.1" x 14.2" x 6.6"	14.1" x 14.3" x 6.7"	19.7" x 19" x 8.7"
Brightness	200 cd/m²	160 cd/m²	160 cd/m²
160° XtraView Technology	no	yes	yes



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rities; Quicken also supports Fidelity Investments and Waterhouse Securities. Both Microsoft and Intuit plan to add up to nine new brokerages over the next few months.

In addition to tracking your portfolio, Quicken's new Security Detail View delivers free news about the securities in your portfolio from sources such as Comstock, Morningstar, and Standard & Poor's. You can then jump to Quicken.com to do additional research. The Mutual Fund Finder, which helps you select from 6,000 funds using the latest ratings downloaded from Morningstar, is an especially strong feature of this version of Quicken and Quicken.com. The free Quicken.com is also home to several investment-related message boards and chat events and has links to other helpful sites as well.

For investment-related services only, Microsoft Investor is a stronger site than Quicken.com. It offers original articles, earnings estimates and analyst recommendations, market updates, and chat boards as well as an excellent stock-screening tool. You can import data on your portfolio from Money to Investor, then request automatic notification of events such as splits and dividends. If Money discovers relevant information on Investor while the program is performing its regular sweeps of the site, you are notified on the Financial Home Page. You can also request e-mail alerts of critical events.

All of this power comes at a price. Some of Microsoft Investor's information is free, but to access the most useful tools and premium content, you must subscribe to the site (\$9.95 per month). Money 98 Financial Suite users receive six months free. Quicken.com is wholly advertiser-supported.

Quicken excels in other areas, most notably in the basic investment tools provided with the program. For example, Quicken offers five standard and two custom portfolio views at a time and lets you classify investments by goal and asset class. The software's new wizard helps to create and track 401(k) accounts.

Both Money and Quicken will meet the needs of individual investors. But Microsoft's edge in online resources is countered by Quicken's wider array of powerful program-based tools for tracking and analyzing investments.

SUMMARY OF FEATURES

Personal Finance Software

PC MAGAZINE
EDITOR'S CHOICE

	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
■ YES ■ NO		
Street price	\$50	\$60
General Features		
Runs under Microsoft Windows 95/Windows 3.1	■ ■	■ ■
Includes browser	■	■
Additional Web resources (price)	Money Insider (free); Microsoft Investor (6 months free, then \$9.95 a month)	Quicken.com (free)
Optional ISP sign-up	MSN	Concentric
Uses home-page-based interface	■	■ ■
Context-sensitive help/Multimedia tours	■ ■	■ ■
Integrates all modules in a single suite	■	■
Getting Started		
Account setup wizard	■	■
File-import formats supported	OFC, OFX, QDB, QDT, QIF	QIF
Number of banking partners	110	53
Links to participating online banks	■	■
Can download credit card statements	■	■
Amortizes loans/Tracks payments	■ ■	■ ■
Managing Accounts and Paying Bills		
Supports automatic online payments	■	■
Tracks paychecks	■	■
Reminds user of scheduled transactions/other account activity	■ ■	■ ■
Can process transactions from reminder screen or icon	■	■
Supports bill presentment from vendor	■	■
User can review downloaded statements/make register entries	■ ■	■ ■
Investing		
Exports program-based portfolio to Web portfolio	■	■
Offers standard/custom portfolio views	■ ■	■ ■
Wizards for managing/tracking lots	■ ■	■ ■
Securities screening tools	■	■
Downloads quotes and news/Updates portfolio	■ ■	■ ■
Offers investment-related information/tools online	■ ■	■ ■
Tracks retirement plans such as 401(k)s	■	■
Downloads brokerage statements	■	■
Can e-mail securities alerts	■	■
Other Financial Services		
Links to current loan and mortgage rates online	■	■
Notifies user of relevant changes in rates	■ ■	■ ■
Offers a direct link to a tax package	■	■
Helps estimate tax obligations	■	■
Guidance on income taxes off-line or online	■	■
Helps user shop for loans	■	■
Helps user shop/apply for insurance	■ ■	■ ■
Planning for the Future		
Customizable financial reports	■	■
Generates monthly reports automatically	■ ■	■ ■
Produces snapshot reports	■	■
Emphasizes top-level totals and debt reduction in budget	■ ■	■ ■
Supports multiple budgets	■	■
Financial assessment tools off-line or online	■	■
Debt reduction module	■	■
Targeted retirement planning	■	■
Targeted savings planning	■	■
Alerts user when goals are slipping	■ ■	■ ■
Generates financial forecasts based on user input	■	■
Provides articles on planning online	■	■
Links to planning- or budgeting-related Web sites	■	■

OTHER FINANCIAL SERVICES

Personal finance software has grown well beyond basic checkbook management to encompass financial services such as loans and mortgages, insurance, and taxes. The services can be complex, but Money and Quicken assist you in understanding them. And thanks in large part to the Internet, the products can now provide the latest loan rates and insurance quotes.

Years of amassing new financial service tools have taken their toll, and not all of Quicken's many modules are integrated. But Quicken still offers a wider variety of financial services, which give the product the advantage over Money.

For example, Quicken has the clear edge in shopping online for new financial services. The newest one, QuickenMortgage, is accessible through Quicken.com. The feature helps you determine how much house you can afford, then lets you apply online for a preapproved mortgage from 6 of the top 25 U.S. mortgage lenders, such as Chase Manhattan Mortgage Corp. and Countrywide Home Loans.

Another area where Quicken excels is in tax preparation, with interactive tools to help you prepare for the annual 1040 tango. For example, you can transfer Quicken data to the tax-estimation tool, where you can annualize amounts and run up to three scenarios. The program's Tax Deduction

Finder helps you pinpoint expenses that may be deductible and helps you set up tracking and a legitimate paper trail. Finally, you can transfer Quicken data directly into any of the TurboTax products. (For details, see "Taming the 1040" in this issue.) By contrast, Money exports data to tax programs in a text-based format.

Money does have its strengths in these areas. Chief among them is the Financial

finance Web sites also offer generous helpings of articles, tools, and other data to help you select the most appropriate financial services. For example, you can find out information on life insurance or locate the right personal financial planner in your area. The articles are written by both Microsoft staff people and industry experts.

Although its tax tools are not as robust as Quicken's, Money does help when it comes to tax time. An internal tax estimator assists you in working up an educated guess about your annual tax obligation. Click a button when you're done and you

can process a tax payment quickly. If you've categorized your income and expenses faithfully, your export from Money into a tax program should be successful. Money Insider can also be a good resource if you're looking for ways to minimize tax obligations.

Both Money and Quicken now offer a range of services designed to meet virtually all of your financial needs. Although Money's intelligent and interactive feedback points to the future of personal financial software, Quicken still has the more powerful and comprehensive toolset.

OTHER FINANCIAL SERVICES

	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
	Power/Ease	Power/Ease
Loan and mortgage rates	Good/Excellent	Fair/Excellent
Tax planning and preparation	Good/Excellent	Excellent/Excellent
Insurance	Fair/Excellent	Good/Excellent
Assets and net worth tools	Fair/Good	Excellent/Good

The program's ability to locate loan and mortgage rates as well as notify users when rate changes can affect them is rated under the category of **loan and mortgage rates**. **Tax planning and preparation** refers to the program's ability to provide tax-estimating tools and links to tax preparation programs. **Insurance** covers how the program facilitates online shopping for insurance, and **assets and net worth tools** reflects the program's ability to track inventory and asset accounts.

Home Page's Advisor FYI, which provides information on financial services tailored to your needs. For example, the program will alert you if the latest mortgage rates, which are automatically downloaded, are significantly less than your current rate.

Money and Microsoft's personal

OTHER FINANCIAL SERVICES

MONEY and its companion site, Money Insider, provide a range of financial services, including advice on insurance.

AT QUICKEN'S InsureMarket site, you get more than advice: You can get rates and apply for new policies.

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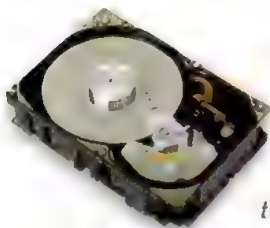
	MultiSync A500™	MultiSync A700™
CRT/VIS*	15"/13.8"	17"/15.6"
Max. Res.	1280 x 1024 @ 60 Hz	1280 x 1024 @ 65 Hz
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Data Rate (Internal)	11.3 to 16.8 MB/sec	11.3 to 16.8 MB/sec
Avg. Seek	7.5/8.5 msec	8.0/9.0 msec
Avg. Latency	2.99 msec	2.99 msec

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PLANNING FOR THE FUTURE

Perhaps the most important new elements of personal financial software, planning features allow you to take advantage of the data you've faithfully collected and organized to achieve long-term goals and avoid potential pitfalls. The features include budgeting and debt reduction, forecasting, and generating reports. Quicken does all this well, but in this one area, Money is even better.

Both Money and Quicken help you to establish long-term financial goals by pulling in existing data on income and expenses and creating what-if scenarios. Money offers two views of your budget—a top-level view of total income and expenses and a detailed breakdown—as well as short-term and long-term forecasts. You can prioritize savings and debt payments. Money updates your goal planning automatically when you make changes in other parts of the program, such as the Account Manager; Quicken's goal-planning modules must be updated manually.

Quicken's forecasting tools may not look as sophisticated or as integrated as Money's, but they are more customizable. Separate financial calculators supplement this process, and you can add one-time or recurring financial events (either income or expenses) to see what effect they would have on the picture. Quicken Suite 98

(\$90 street) provides two additional planning tools, Quicken Financial Planner 3.0 and Quicken Family Lawyer Deluxe.

One planning area in which Quicken excels is debt reduction. Both programs help prioritize debt payments, evaluate options, and create graphs that show when you'll be debt-free. But Quicken weighs the effects of transferring money from savings and reducing current expenses to help pay down debt.

One key advantage of keeping your financial records on your PC is that you are provided with feedback and analysis. Although both programs offer customiz-

Report, an automatically generated summary of income, expenses, and investments—and more complete with charts and analysis—is long overdue. Advisor FYI also provides tips on long-term financial planning. Quicken's newest addition to the category is Snapshots, a set of six graphs displayed as thumbnail images on a single screen. A new Reports Toolbar lets you customize reports on the fly.

In general, we found the online planning resources at Money Insider more extensive and useful than those at Quicken.com. Among the resources at Money Insider are interactive tools and articles on college tuition, estate planning, and retirement.

Both Money and Quicken include modules that let you keep an inventory of valuables in your home, which can be useful for

calculating net worth and for insurance claims. Quicken Deluxe 98 adds a new Emergency Records Organizer, which allows you to keep important information in one place and print reports.

Although both products have come far, Money is a pioneer with

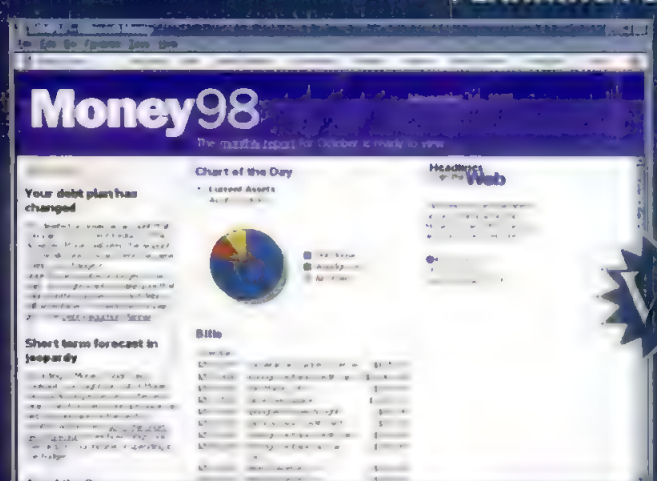
its planning feature. In this area, Quicken could learn from the competition. **PC**

PLANNING FOR THE FUTURE

	Microsoft Money 98 Financial Suite	Quicken Deluxe 98
	Power/Ease	Power/Ease
Budgeting	Excellent/Excellent	Fair/Good
Debt reduction	Fair/Excellent	Good/Excellent
Goal planning	Excellent/Excellent	Good/Good
Reports and analysis	Excellent/Good	Good/Excellent

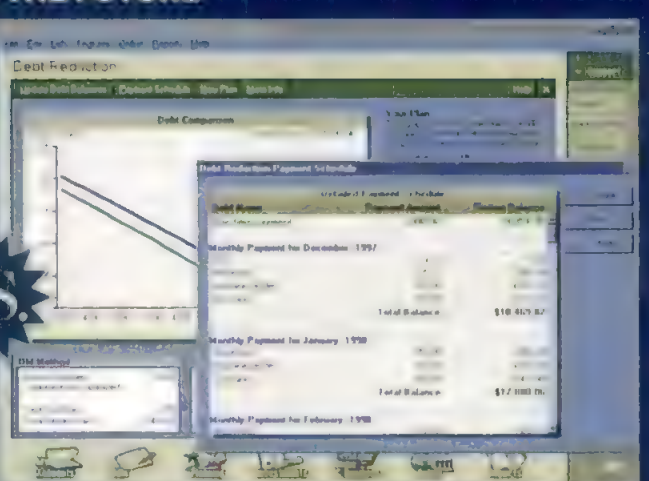
Budgeting reflects not only the program's ability to produce budgets but also whether such budgeting features can interact with other parts of the program and offer advice to the user. **Debt reduction** relates to the program's strategy in advising the user on how to pay off loans, reduce expenses, or transfer funds. **Goal planning** reflects the program's ability to establish and track financial goals. **Reports and analysis** refers to the program's supply of standard financial reports and its ability to chart and customize this data.

able reports, Money has set a new standard in this category. The new Monthly



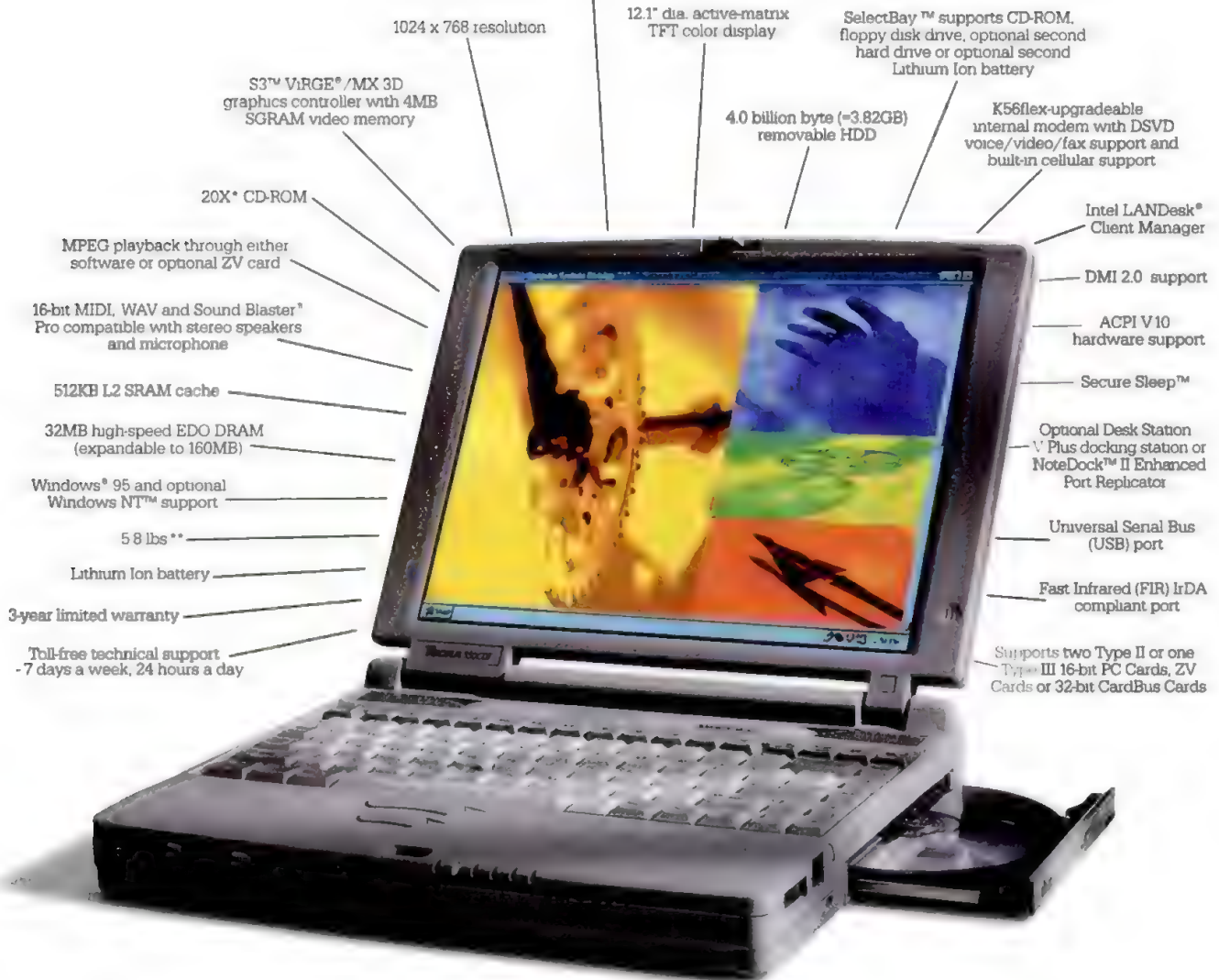
MONEY 98'S innovative home page gives you a snapshot of your finances.

VS.



QUICKEN'S debt-reduction feature is one of its stronger planning tools.

**266MHz
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The new Tecra 550CDT is phenomenal. It gives you the power you need and the features you want. Make a power statement with the new Tecra™ 550CDT from the world's leader in portable technology — Toshiba. The Tecra 550CDT delivers a 266MHz Pentium processor with MMX technology. But there's more to it than power. Equipped with lots of expandability options and plenty of system management support, the Tecra 550CDT is the solution for the most demanding power user. And as always, this amazing new portable is backed by the quality, reliability and service and support you've come to rely on from Toshiba. **To learn all about Toshiba's power offerings, visit <http://computers.toshiba.com> or call 1-888-598-7802.**



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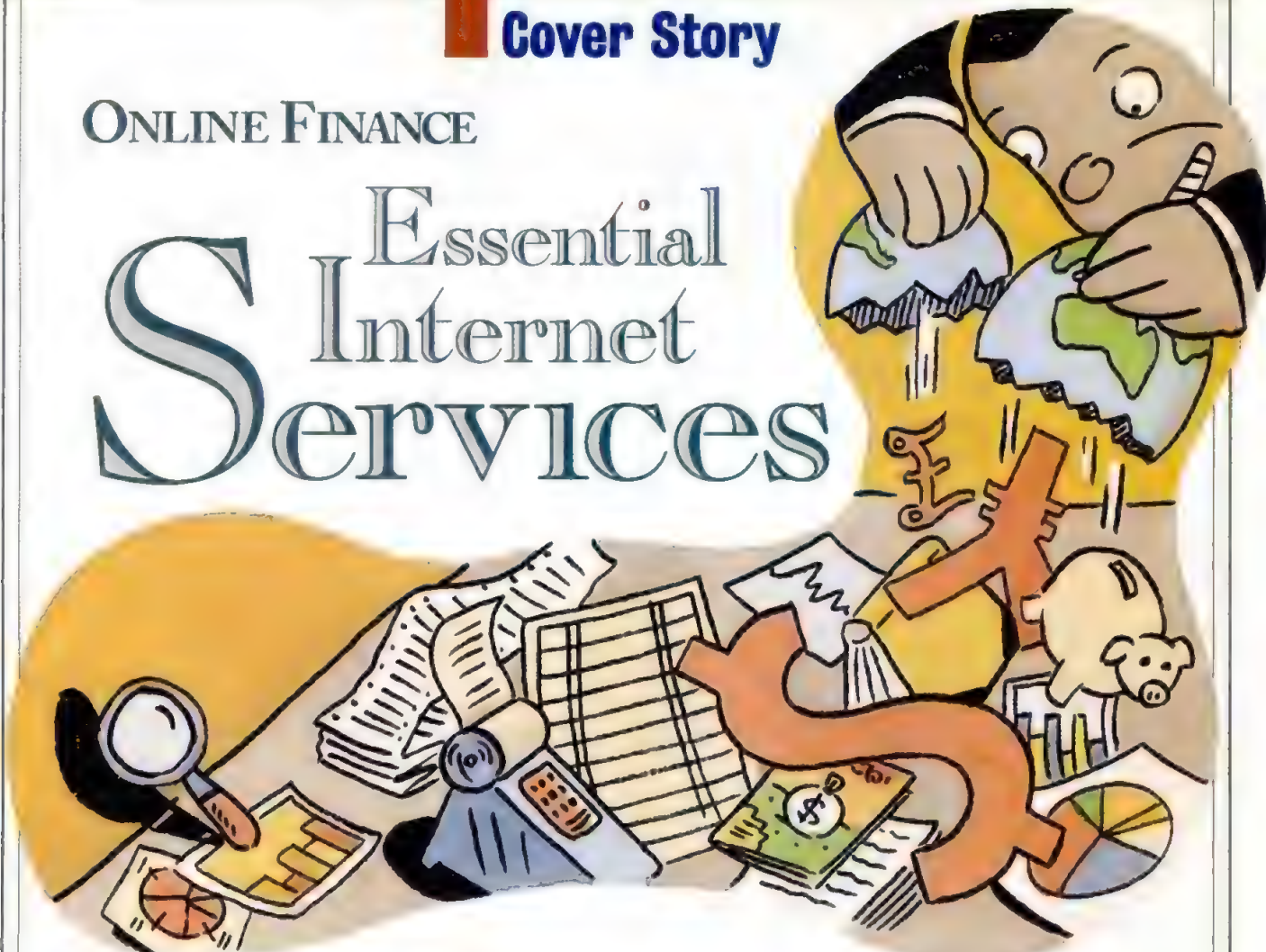
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ONLINE FINANCE

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Use the Web to help plan life's biggest financial decisions with interactive tools and resources from 35 sites. *By Jan Ozer*

\$trange how a lack of information can breed inertia. You suspect your mutual funds are laggards, but you don't sell, because it's difficult to compare them with others. You put off buying life insurance, because you can't easily price policies or evaluate the differences between term and whole-life. And you continually postpone retirement planning, because even the SIMPLE IRA just doesn't sound so simple.

Well, the Web can empower you when you're addressing these key issues. We evaluated seven Web sites that provide a wealth of information on five key life-planning areas: buying insurance, making investments, buying a home, planning retirement, and preparing taxes.

These sites are mostly free; at worst, they charge about \$50 a year. Now there's no reason not to be in better financial control.

The sites largely come from established sources: The financial publishing stalwarts *Money*, *SmartMoney*, and *The Wall Street Journal* all have online incarnations, and personal finance software titans Intuit and Microsoft Corp. also have created sites that seek to answer your fundamental life-planning questions. (For a comparison of the latest versions of their products, see the story "Money 98 vs. Quicken 98" in this issue.) America Online, with a base of 10 million users, has assembled a collection of resources for its users, and because this is the Web, even a

America Online Personal Finance Channel.....	131	Quicken.com.....	140	Retirement Planning.....	134
Errol F. Moody, Jr.	134	The Wall Street Journal Interactive Edition	142	Tax Preparation.....	136
Microsoft Money Insider.....	134	SmartMoney Interactive	142	Home Buying.....	140
Money.com.....	136	Editors' Choice.....	131	Insurance.....	142
		Investment Tools and Advice.....	132	Online Trading.....	146

"little guy" like E.F. Moody can compete with the Microsofts of the world.

We also took a look at specialized Web sites that cater to each of the financial planning areas that we consider here, as well as trading sites that let you buy and sell securities online. These sites often benefit from focusing on just one topic. They can offer more depth and better tools than the life-planning sites that try to be a one-stop shop for all your financial matters.

On the investment front: Most of these sites let you create multiple portfolios and check stock quotes on a 20-minute delay. The best sites provide formal stock and mutual-fund selection tools that identify potential investments based on your criteria.

The wealth of research materials available should make the uninformed investment decision obsolete. Virtually all sites provide industry descriptions, performance ratios and graphs, and access to financial statements. The more advanced sites provide SEC filings, news wire services, and analysts' ratings.

None of the main sites we covered offer customized e-mail notifications that

warn of specified market changes. Specialized investment sites often offer this feature, and you will also find that some deliver a greater depth of analysis than many of the general sites.

The burning question of the nineties, whether you're a baby boomer or a generation X-er, is how to build a nest egg large enough to fund your retirement years. These sites help you face this question with the help of detailed calculators that let you determine how much to start setting aside today. The best sites also provide investment guidance, tailoring the aggressiveness of your investments to your risk tolerance and number of years to retirement.

Buying a home? Most sites provide calculators for computing how much house you can afford and what your estimated monthly payments will be. Several let you analyze fixed versus adjustable mortgages, or help you decide when to

refinance your home. The best sites, such as Quicken.com, help you complete a prequalification checklist, compare mortgage interest rates, and even contact a bank. Specialized sites can help you shop for available properties online.

We were surprised that many of the life-planning sites produced only token offerings in the insurance and federal income tax arenas. For insurance, most provided calculators to compute only the amount of required life insurance, plus some reconstituted content. The best sites, such as Quicken.com, use a short questionnaire to identify your insurance needs, ask some prequalification questions, and then put you in touch with an agent for life, disability, auto, or other types of insurance.

Tax-help offerings were even more limited, with only Quicken.com providing an estimated-tax calculator and AOL's Personal Finance Channel offering federal tax

www.pcmag.com

Are you a player in the market? Check out the PC Magazine Web site for an interactive look at online finance tracking.

Our Contributors: JAN OZER is a contributing editor of *PC Magazine*. ALAN COHEN and JILL LÉGER are freelance writers. JAY MUNRO was the project leader and DAVID LIDSKY was the associate editor in charge of this story.

SUITABILITY TO TASK

	America Online Personal Finance Channel	Errol F. Moody, Jr.	Microsoft Money Insider	Money.com	 Quicken.com	The Wall Street Journal Interactive Edition, SmartMoney Interactive
POWER						
Tax preparation	Good	Poor	Good	Fair	Good	Poor
Investment advice	Good	Poor	Fair	Good	Good	Fair
Retirement planning	Good	Fair	Fair	Fair	Excellent	Poor
Mortgage assistance	Good	Fair	Good	Fair	Excellent	Fair
Insurance buying	Good	Fair	Fair	N/A	Excellent	Fair
EASE						
Tax preparation	Good	Good	Excellent	Good	Excellent	Fair
Investment advice	Fair	Good	Excellent	Excellent	Excellent	Good
Retirement planning	Good	Good	Excellent	Good	Excellent	Fair
Mortgage assistance	Good	Good	Excellent	Good	Excellent	Good
Insurance buying	Good	Good	Excellent	N/A	Excellent	Good

N/A—Not applicable: The Web site does not have this feature

Tax preparation We look for a necessary complement of forms, information, and interactive tools to help you prepare for income taxes. Services should offer downloadable federal and state tax forms or at least direct you in how to obtain them online. A calculator to help you determine estimated returns or payments is an especially welcome tool. Information on the appropriate forms to complete and on the 1997 Tax Act are helpful additions.

Investment advice We rate the tools available to help you manage multiple portfolios and select new investments, including stocks, mutual funds, and other options such as commodities. Offering access to high-quality, easily configurable data improves the *power* and *ease* ratings of services. We look for both stock and mutual-fund selection tools with a variety of indexes to use in evaluation, including year-to-date and historical data and customizable charts. Services should offer e-mail notification and options that alert you of pressing financial occurrences.

Retirement planning We review the available advice, interactive tools, and resources to assist you in developing realistic strategies for retirement. Tools that help you figure out how

much you need to save are highly beneficial, but we also look for services that follow up with investment advice to help you meet your goals.

Mortgage assistance We evaluate how you can obtain assistance in getting home mortgages online. Services receive higher scores when they feature an abundance of useful calculators to figure out how much home you can afford based on your finances and determine the right kind of mortgage for you. We look for access to current mortgage rates. We like services that let you prequalify for a loan by completing worksheets and that help you find a realtor.

Insurance buying We consider the availability of tools and content to help you research and ultimately to buy insurance online. We look for tools that help you determine the best types of insurance for your needs. We evaluate how easily you can learn about the variety of insurance options (life, health, and auto). The sites that fare the best in our evaluation have the most interactive, easy-to-use calculators to help you figure out how much insurance to buy and which types of insurance you need. Being able to get price quotes online is a decided bonus.

forms as PDF files. But most sites detail the new provisions in the 1997 Tax Act, and virtually all provide useful links to other sites that help you find a tax professional or even file your tax return online. Many other sites on the Web can help you answer your insurance and tax-preparation questions. Also, see After Hours in this issue for a roundup of tax-preparation software.

The staggering amount of useful information and services online represents a significant potential savings of both time and money. Given that these are our two scarcest commodities, this roundup will help you find a site—or a combination of sites—that best serves your life-planning needs.

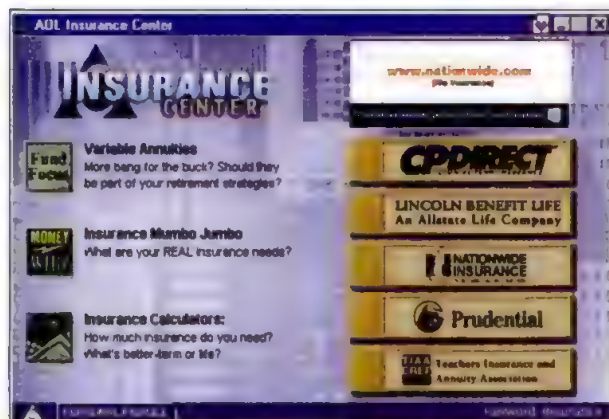
America Online

America Online Personal Finance Channel

ALL REVIEWS BY JAN OZER

With possibly more information gathered together than any other service, AOL's Personal Finance Channel contains almost an excess of data and offerings from both original and secondary sources. This mass of resources for online finance does not cohere, because the channel lacks the kind of all-encompassing, step-by-step approach to planning that Quicken.com provides. The constantly shifting sources of AOL's content—some from AOL, some from the Web—makes assimilating the information difficult. AOL subscribers can benefit from the channel, but the content and services exclusive to AOL aren't valuable enough for a user to join just to access them.

AOL's insurance section links you to Smartcalc.com's excellent calculators (www.smartcalc.com). There, you can



AOL delivers lots of articles and links to Web tools.

Editors' Choice

• Quicken.com



One site offered the most comprehensive set of interactive tools to help you with your insurance, home-

loan, tax-preparation, investment, and retirement-
planning needs, and therefore we award that site, Quicken.com, our Editors' Choice.

Quicken.com offers an approach that starts at the beginning of your decision-making process. When you are evaluating insurance, you can start by figuring out which type of insurance is best for you. When you are going to buy a home, you first calculate what your budget will allow. Quicken.com then distinguishes itself by following through and helping you complete a loan prequalification worksheet or get a price quote on a life insurance policy.

As strong as Quicken.com is, sometimes you need a specialized service for a particular need. When it comes to investing, no one site gives as much power to the average investor as Microsoft

Investor, which earns an honorable mention. Of the many sites devoted to giving investment assistance, Microsoft Investor gives you the best online portfolio manager. It lets you track your gains and losses and even factors in your commission fees. For \$9.95 a month, Investor also delivers a mass of valuable research data with excellent flexibility in viewing the information you want. We considered Investor separately from its sister site, Microsoft Money Insider, which covers all of our life-planning topics, because the two are not integrated (in the way that Quicken.com integrates all its services within one site).

You should check out other services designed specifically for life-planning topics such as retirement planning. Specialized sites often provide more depth than the general sites we reviewed.

determine your life-insurance needs and compute the returns on whole, universal, and variable life insurance. On AOL, you get a wealth of articles that include tips on buying home, disability, and auto insurance, and you also get chat rooms where you can discuss insurance-related topics.

On the investment front, AOL-based services include StockMaster, for stock

graphs and financial statements, and SEC filings from Disclosure Inc. and EDGAR. First Call provides earnings estimates and also allows you to import historical quotes into Quicken or save them in comma-delimited format.

Morningstar.Net is the most prevalent source for mutual-fund information. On AOL, you'll find the standard

historical price information and more specialized data such as consolidated P/E ratio and investment turnover. This data is a subset of the information available from the Morningstar.Net site (www.morningstar.net). Although the site contains fund listings by performance criterion, the listings fall short of the formal fund-picking tools included on sites such as Microsoft Investor.

Those preparing to take on mortgages will appreciate access to Smartcalc.com's wide range of calculators, which can compute how much you should spend on your home and estimated monthly payments. AOL's Bank Rate Monitor supplies current mortgage quotes from lenders in your geographical area along with links to their Web sites. Smartcalc.com also provides retirement calculators, which cover such basics as how much you should invest each year to meet your retirement goals and how to determine your post-retirement income and expenses.

Specialized Web Sites INVESTMENT TOOLS AND ADVICE

Whether you're a fast-twitch commodities trader or a long-term investor, the sheer volume of investment-related data available on the Internet, although incredibly useful, can almost paralyze you. We evaluated 19 sites (including the sites in the main roundup) that cover a broad range of investment options. We recommend **Microsoft Investor** (investor.msn.com) for portfolio tracking and research, and we suggest that you try any of the sites noted below for more specialized needs.

Providing online stock quotes, which are available from almost every site at 15- to 20-minute delays, is not a very remarkable feature, but a few sites offer the premium of real-time quote availability or access to more specialized quote information or both. The best deal going at the moment is at **Thomson Investors Network** (www.thomsoninvest.net) which provides up to 50 real-time stock quotes per day for free. For unlimited quotes, consider **Reuters MoneyNet.com** (www.moneynet.com), which costs \$29.95 a month for quotes on stocks, options, mutual funds, and indices.

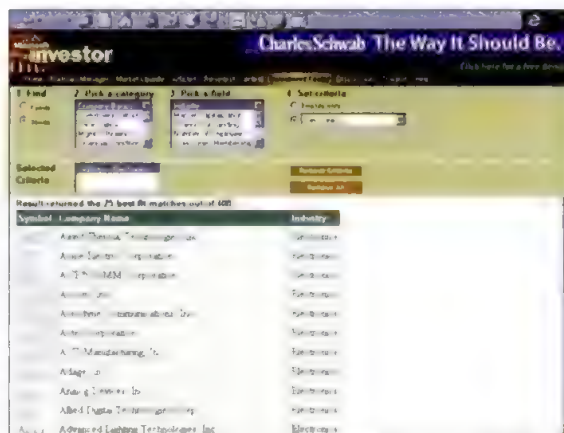
In case you really want to narrow the information gap between your broker's Bloomberg terminal and your PC, **DBC Online** (www.dbc.com) offers access to a range of exchanges in real time, including commodities and international exchanges. Bring your checkbook, though: The service costs \$150 a month, paid a year in advance, plus exchange fees. It also includes event notification via e-mail, pager, or cell phone.

Microsoft Investor (\$9.95 a month) offers the best e-mail notification of delayed information. The service tracks up to ten investments, e-mailing you when an investment hits a specified price or changes by a specified percentage or dollar amount.

Tracking of your portfolio can be done at almost any site. The best services, such

as **Microsoft Investor**, let you input both a per-share purchase price and a commission, so you can accurately track both your cost basis and gains and losses.

Finding investments is a two-step process. First you need a tool to help you spot potential investments, but only a few sites have formal stock-selection tools that let you identify candidates by your own criteria. Among the best are those provided by **Quicken.com** (www.quicken.com) and **Investor**. Both sites can search for stocks within specified industries and rank them according to criteria such as growth rates, P/E, and other financial ratios, as well as by company size. Quicken.com's strength is its simplicity of operation, and Investor excels at enabling very flexible searches. You can shun the hard work, though, and latch onto the latest analyst recommendations from **Zacks Investment Research** (www.ultra.zacks.com).



Microsoft Investor lets you identify stocks by defining a set of criteria.

Researching your investment candidates is the second step in the process, and the best sites consolidate significant amounts of data into easily accessible forms. Investor includes configurable stock-price graphs, summarized analyst projections and recommendations, and an array of useful financial ratios. And no thorough stock research is complete without checking the company's SEC filings. They're available from EDGAR Online via several sites, including **Money.com** (www.money.com) and **TheStreet.com** (www.thestreet.com). 2D Interactive In-

vestor (www.zdii.com) will help you separate the true cyberstars from the one-disk wonders while looking for a high-tech stock. This site turns up a wealth of financial data for over 400 high-tech businesses.

Shopping for mutual funds is similar to picking stocks. **Morningstar.Net** (www.morningstar.net) is a great first stop for evaluating your fund candidates. Although many sites provide Morningstar-based information, it's typically only a portion of what is provided free at the Morningstar site. You'll find comparative performance, pricing/expense-ratio data, details like group P/E ratio, and complete Morningstar ratings and technical measures such as volatility.

Options investors should check out **Quote.com** (www.quote.com), which provides basic quotes and several levels of strategy analysis. This site is a step ahead of Reuters MoneyNet, which provides only quotes.

Bond market coverage can be found extensively at **Briefing.com** (www.briefing.com) and **DBC**. Each has an abundance of information such as earning surprises, IPO and stock-split schedules, and analyst upgrades and downgrades. Thomson is one of the few sites that track the municipal-bond market. Briefing.com is particularly good for investors watching major U.S. and international indexes and economic fundamentals such as

unemployment reports and leading economic indicators.

Interesting editorial content is the province of **The Motley Fool** (www.fool.com), with its pithy discussions of stocks and investment strategies. Fund investors should drop by Morningstar, which provides fund-related tutorials, feature stories, news, and interviews, as does **TheStreet.com**. Finally, **invest-o-rama** (www.investorama.com) provides a number of stock- and fund-related tutorials as well as very useful commentary from a number of disparate sources.—JO

New Quicken[®] deluxe 98

Cari Jacobs may be celebrating a \$450 tax deduction after all.



The Lamonds will save \$220 on their life insurance next year.



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Uncover important tax deductions. Locate tax breaks and play "what-ifs" with

our updated Tax Deduction Finder and Tax Planner.

Find a great mortgage deal. Make apples-to-apples comparisons of rates from leading national lenders, all in one place. Get a better deal in a fraction of the time it takes to shop around.

Pay less for insurance. Eliminate multiple agent meetings and paperwork, find the insurance you need online, and compare rates from Prudential, John Hancock and more – with no pressure to decide.

Prepare for emergencies. Protect your family's finances by keeping your

personal, legal, financial and medical records organized and ready with Emergency Records Organizer.

And if you use Quicken for business and personal finances, new **Quicken Home & Business** (for Windows) is now available – with important extras like customized invoicing.

Get new Quicken Deluxe 98 today!



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Mac & Windows compatible. Year 2000 ready. Rebate applies to previous Quicken users who buy at retail or online.

Specialized Web Sites RETIREMENT PLANNING

Retirement Web sites are as plentiful as Boca Raton condos. Here are the three best sites offering the tools you'll need to help make those sunset years as comfortable as possible. All in all, we found better specific information and more interactive tools at the specialized sites below than at SmartMoney or other general life-planning sites.

American Express Retirement Services (www.americanexpress.com/401K) focuses on 401(k) plans, which the company provides. But the sales pitch is kept to a minimum, and the site has a lot to offer. Interactive tools include a calculator that projects the size of your desired nest egg and how much you will have to save each month to achieve it. Another calculator shows, rather dramatically, how your monthly payment will increase if you wait one, three, five, seven, or ten years before contributing to a 401(k).

RetireNet (www.valic.com), created by The Variable Annuity Life Insurance Company, offers retirement information for employers and employees. Articles provide techniques for increasing participation in plans as well as guidelines for training benefits administrators.

For those considering alternatives to a 401(k), **T. Rowe Price** covers a panoply of options at its site (www.troweprice.com/retirement). Both retirement plans for individuals (such as IRAs, rollover IRAs, and variable annuities) and plans for businesses (such as Simplified Employee Pensions, Keogh plans, SIMPLE IRAs, and 401(k) plans) are offered and explained in clear, easy-to-understand language. The site is quite candid, explaining that 401(k)s can be complicated to set up and maintain. —Alan Cohen



AOL provides many U.S. tax forms and tax publications as PDF files. Also included are comprehensive discussions of the 1997 Tax Act from several sources and links to help you locate a tax advisor, file your taxes online, and buy tax-preparation software. Missing is a 1997 estimated-tax calculator or calendar, available from Quicken.com and H&R Block.

AOL offers a range of content from many sources. It can benefit a wide range of readers, as long as they're willing to dig for the information and deal with the interface hassles of a service caught between the Web and its proprietary past. **America Online Personal Finance Channel.** Price: Free for AOL subscribers. Keyword: *personal finance*.

E. F. Moody, Jr.

Errold F. Moody, Jr.

In tone and style, the Errold F. Moody, Jr. Web site is definitely different from its competitors. Moody is maintained and written primarily by Mr. Moody himself, a former educator with over 20 years of financial-planning experience. Moody's original content is more focused than the one-size-fits-all articles found at most other sites, though the author's quirks, such as his strong affinity for the HP 12C calculator, can wear on you. Devoid of blinking, up-to-the-second news, Moody provides little day-to-day value, but the site is still worth checking out, if only to help you become familiar with myriad other free resources available on the Net.

Regarding insurance, Moody provides life-expectancy and disability statistics, worksheets for life and disability insurance, and articles describing annuities and types of insurance. Moody also supplies links to several sites that rank insurance companies and to the Disability Forum, a key site for obtaining information on disability insurance.

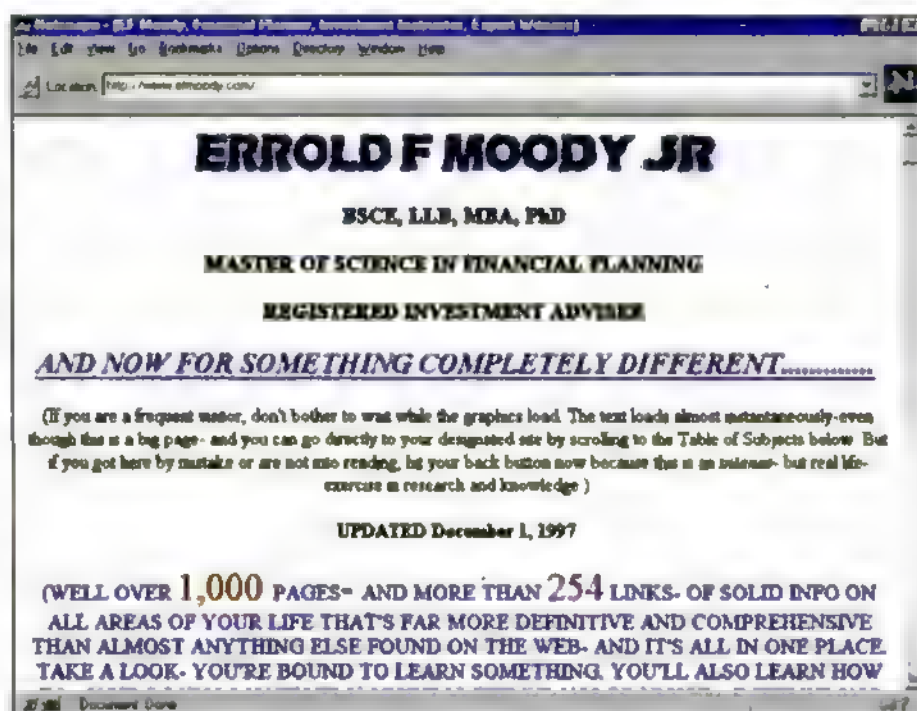
On the investment front, Moody offers neither portfolio tracking nor data on specific stocks, funds, or other markets. The site does, however, serve as an effective front end to stock information, linking you to six free sites with stock-screening

tools, including Hoover's Online.

Similarly, Moody's primary value for home buyers relates to links to other sites. You'll find links to Owners.com, with more than 30,000 homes for sale by owner, and the National Association of Realtors, with more than 800,000 listed homes and several sites providing current interest-rate information.

For retirement-minded users, Moody provides a life-expectancy table along with a savings-goals worksheet, but it doesn't measure up when compared with the one at Quicken.com. Worthwhile links include the Pension and Welfare Benefits Administration, the Pension Benefit Guarantee Corporation, and the Social Security Administration.

A summary of the benefits of the 1997 Tax Act highlights Moody's tax-related content. The site also provides links to the IRS, the complete tax code, and a site with links to state tax forms, which is incredibly valuable to procrastinators.



Errold F. Moody, Jr. provides lots of advice and links but no up-to-the-second news.

Moody provides a solid overview in most life-planning areas, but this is not the kind of site that you would use as a primary financial resource.

Errold F. Moody, Jr. Price: Free. www.efmoody.com.

Microsoft Corp.

Microsoft Money Insider

Though the free Microsoft Money Insider site offers interesting content, it has few truly useful analysis tools. It doesn't offer the kind of investment tools that other services such as Money.com or SmartMoney Interactive offer; instead, Money Insider expects you to use Microsoft Investor for

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Printer on page 21 of
28 page presentation

Specialized Web Sites

TAX PREPARATION

User-friendly is not a term often applied to the world of tax preparation. Although most of the sites in our roundup provide basic information on taxes, the best specialized sites offer much more.



The place to start is at the **Internal Revenue Service Web site** (www.irs.ustreas.gov), a stylish, up-to-date site that—we dare to say—manages to enliven tax preparation. You can download hundreds of federal forms, and you get links to state forms. A color-coded calendar displays important filing dates, and summaries of tax-law changes and IRS regulations are presented in plain, easy-to-follow language.

At **H&R Block** (www.hrblock.com/tax), the focus is less on procedure and more on advice. A tax-refund calculator tells you what (if anything) you should be getting back from the IRS this year; a section devoted to the Tax Relief Act of 1997 explains the various provisions of the new law. Particularly useful is the site's tax record checklist: By helping you itemize all forms of income and all deductions, it helps ensure that you won't overlook anything come April 15.

For a helpful list of links to tax-related resources on the Web, **TaxWeb** (www.taxweb.com) fills the bill. From this site, you can call up federal and state sites, tax publishers, software developers, professional organizations, and tax-related discussion groups and mailing lists. The page most visitors will want to check out contains a list of guidelines and telephone numbers used for inquiring about state tax refunds.

—AC



investment services. Investor is an excellent resource for investment tools, but it is a separate site and thus is considered separately. (See the sidebar "Investment Tools and Advice" for a review of Investor.) As a result, Money Insider is less useful than other sites, such as Quicken.com, that provide similar information in clear, well-integrated designs with more direct approaches.

In essence, Money Insider's investing section provides long-term content and analysis tools for Investor. That said, we found the lack of integration between Money Insider and Investor surprising. Although Money Insider has a few useful features, especially its discount broker-selection worksheet, the content is static, and you have to go to Investor to check stock and mutual-fund pricing, search investments, and learn about recent stock-market action.

Money Insider's insurance section is sparse, consisting of several general articles and a calculator for computing your life-insurance needs. On the tax front, Money Insider offers a number of interesting articles on various topics. But its primary tool, the tax-computation calculator, was under construction during our review.

The mortgage section falls short of others, like the one found in Quicken.com, that offer prequalification worksheets, home-affordability calculators, and sections for finding homes, realtors, and

and expenses, the charts never tell you the critical number: how much you need to save each year to meet your retirement target. The calculators are difficult to use, because you need to have a handle on obscure, almost unknowable details, such as planned spending on gifts and entertainment during your retirement years, in order to get results.

Money Insider's content is primarily composed of original articles from recognized authors. Although universally relevant, none of the articles are as topical as those exclusively in Microsoft Investor.

Other noteworthy sections provide comparative data on credit card costs and savings vehicles such as money-market funds and certificates of deposit. Unfortunately, this wealth of information emphasizes Money Insider's failure to channel users toward any useful result.

Microsoft Money Insider. Price: Free. moneyinsider.msn.com.

Money Magazine

Money.com

Stock pickers and traders dedicated to international and other narrowly reported markets will find the free Money.com site, and especially its \$49.95-a-year Plus service (\$29.95 for Money subscribers), a dream come true. Mutual-fund investors and those looking for guidance in noninvestment life-planning areas, however, will find the site a nonstarter and are better off using Quicken.com.

On the investment front, Money.com does not offer formal fund- or stock-selection tools at this time, although they are expected to be available online by the time you read this. You do get lists of top-performing stocks and funds in a number of categories to assist you in choosing new investments. Once you've identified a hot stock, you can check out an unparalleled set of

Money Insider's retirement calculators are difficult to use, because they require hard-to-estimate details.

lenders. Money Insider has calculators only for deciding whether to buy or rent and for determining mortgage payments.

While Money Insider has the requisite calculators for figuring retirement income

analysis tools, including Zacks' analyst ratings and earnings estimates, investment ratings from First Call, Investnet, and InnoVest, and SEC filings.

The Money.com Plus service adds sum-



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Specialized Web Sites

HOME BUYING

Home shopping on the Internet has taken on a literal cast with the advent of sites aiming to ease the stress of buying a house. While Quicken.com offers the most impressive home-buying information of the general life-planning sites, you will find more depth in one of these specialized information-based resources or real-estate-buying sites.

Countrywide (www.countrywide.com) and **HomeShark** (www.homes shark.com) are two comprehensive information sites recommended for first-time home buyers, but they are also useful for current home owners. Both let you explore refinancing options and mortgage and loan opportunities; you can even fill out forms to prequalify. At these sites, you can use your own financial information to calculate exactly what you can afford.

Countrywide, an independent home lender itself, guarantees its home-equity loan quotes for 30 days. **HomeShark** does a nice job of letting you find what you want easily by breaking its content into categories, such as "Your Home: What's It Worth?" and "Should You Refinance?"

Those who are ready to shop can turn to real-estate sites. **Realtor.com** (www.realtor.com) contains information on more than a million properties and lets viewers conduct customized searches in selected cities. Once you pinpoint a desired location, you specify cost and room requirements, then pull up a list of matches.

Though its listings aren't as plentiful as **Realtor.com**'s (it reports carrying about half a million), the similar **Listinglink** (www.listinglink.com) extends its offerings farther than its competitor's by including land and commercial property. Both sites let you browse member agents' personal profiles. —Jill Léger



mary financial reports, detailed performance and market ratios, First Call earnings-consensus reports, and summary investment and insider reports from Investor Insight. The only negative is that Plus's price graphs are not configurable, making comparisons with other stocks or indexes difficult.

Money.com is one of the few sites that provides bond yields and currency conversion rates. You also get summary quotes for 14 international markets and data on miscellaneous markets such as the Russell.

Mutual-fund data is not nearly as useful. **Money.com** forgoes the popular Morningstar ratings for the more technical CDA Wiesenberger data, which often goes beyond the needs of nonprofessional investors.

Money.com doesn't address insurance buying. Its home, retirement, and tax sec-

offers for market data to the other life-planning areas, **Money.com** will be one to watch over the next few months.

Money.com. Price: Free; Plus service, \$49.95 a year, or \$29.95 for **Money** subscribers. www.money.com.

Intuit Inc.

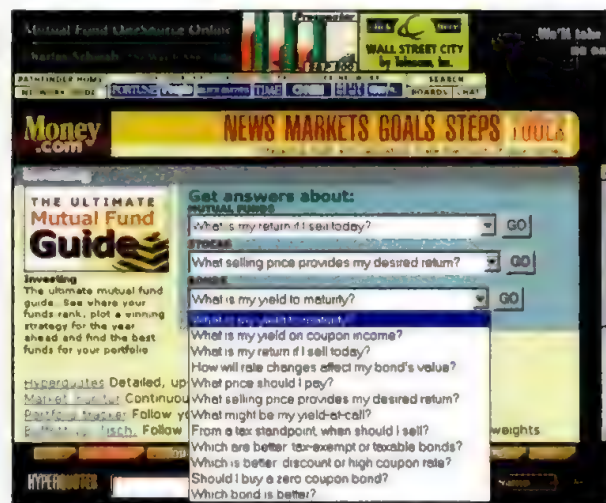
Quicken.com



Featuring a thorough advisory approach, **Quicken.com** offers excellent stock and mutual-fund selection tools and an uncluttered, easy-to-follow layout, all at no charge. Anyone seeking online help with financial life planning should take a long look at **Quicken.com**.

Quicken.com's consultative method immediately becomes apparent in its insurance section, **InsureMarket**. You start by completing a planner that lists in order of priority your insurance needs, and then you use worksheets to help you choose the appropriate type of life insurance and the proper amount to buy. Armed with this information, you can get quotes for life, disability, and long-term-care insurance and contact a number of insurance companies.

On the investment front, **Quicken.com** makes it easy to manage your portfolio through the site. You can input



Money.com has a strong investment section, particularly for less reported markets.

tions combine useful but not especially noteworthy tools with magazine articles and some external content. For example, tax tools analyze whether you're a candidate for an audit and calculate tax savings stemming from the 1997 Tax Act, but they don't estimate your current year's taxes. **Money.com** offers a fairly comprehensive calculator for computing retirement income but doesn't give any portfolio advice to help you achieve your goal.

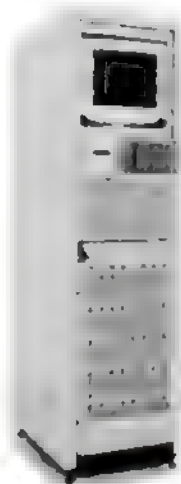
Similarly, the home section provides a city-to-city cost-of-living comparison and a mortgage calculator, but its "best rates" for first and second mortgages were three months out of date.

If it adds the kind of depth it now

multiple portfolios and conveniently place a custom mini-portfolio on the site's front page. You can search for new stocks using canned strategies or by industry class, growth rate, company size, and a number of other financial measures such as P/E ratio and earnings per share. One odd note, though, is that you cannot easily track a portfolio set up using the **Quicken** software package through the Web site without reentering all the data.

Once you've identified targets, you can examine reams of information from SEC filings, including complete financial statements, historical stock quotations, and customizable stock-pricing charts. But financial analysis is limited, and the site

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While Compaq's 8-way server languishes in a six-month countdown, HP's LXr Pro 8 has already left the pad. Optimized for the NT operating system, the HP LXr Pro 8 is the first server from a top-tier vendor to deliver the 8-way Intel® Pentium® Pro processor, and the only server to deliver the next generation of I/O throughput with I2O disk array technology. It's one small step for HP, one giant leap for IT. Visit us at www.hpresource.com/lxrpro8 or call 1-800-533-1333.

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INSURANCE

Insurance Web sites suggest a tempting idea: to be able to buy coverage, with no annoying salesperson. Although the sites we consider have online applications, you should still expect a call from a human. What the sites do offer is a way to get the ball rolling, by calculating your needs and comparing policies and quotes. They also tend to be more comprehensive than most of the general life-planning sites, with the notable exception of Quicken's InsureMarket service.

RightQuote (www.rightquote.com) is designed to take the place of an insurance agent. An online form computes the amount of life insurance you need by taking into account your age, sex, and smoking habits; the site then returns quotes from several companies. You click on each company's name to get more information as well as its ratings from Standard and Poor's and A.M. Best Co. Once you have chosen a policy, you fill out a preliminary application online. An agent will then call you to complete the paperwork and arrange for your medical examination.

InsWeb (www.insweb.com) is another site where you can answer a short questionnaire to obtain free quotes. If you are evaluating car insurance, an Auto Coverage Analyzer determines the types and amount of coverage that are best for you. InsWeb also offers an Agent Locator and hosts Web pages for insurance agents.

For a treasure trove of insurance-related statistics, the place to go is the **Insurance News Network** (www.insure.com). Here you can learn which type of automobile is most prone to theft and which is least likely to be stolen. The site also boasts a feature that we didn't see anywhere else on the Web—an interactive rate guide for California earthquake insurance.—AC



has little analyst-based information other than reports from Standard and Poor's and Disclosure Inc.

Mutual-fund options are more extensive. You can select funds by Morningstar rating, minimum investment, front load, expense ratio, and a number of performance criteria. After narrowing your choices, you can check complete Morningstar reports, with flexible charting options for comparing candidates with other funds or with the markets in general.

Quicken.com. Price: Free. www.quicken.com. (Also available from www.excite.com as the Business and Investing Channel.)

Dow Jones Interactive Publishing,
Dow Jones & Co.

The Wall Street Journal Interactive Edition, SmartMoney Interactive

Two distinct, newsy sites come together in one subscription package: The Wall Street Journal Interactive Edition and

SmartMoney Interactive, for \$49 a year (\$29 for subscribers to either print publication). You get a lot of great financial news and analysis at both sites that you won't find elsewhere, but those looking for structured guidance in major life-planning areas should look elsewhere.

The two sites effectively stand separately; this causes some duplication

of tools (for example, there are two portfolio managers), but the sites complement one another in some ways. The Interactive Journal is not competitive with other sites regarding most life-planning topics: Its strength is in stock-investment advice. SmartMoney's tool set is slanted toward the magazine's fund-oriented investment philosophy, so you get perspectives on both stocks and mutual funds in one package.

The content is definitely king with this package. You get a nearly identical version of the print *Wall Street Journal*, *Barron's Online*, and *SmartMoney's* print and online features. We especially liked SmartMoney's clubby, insider edge. Highlights include the Pundit Watch, where you can track the predictions of major Wall Street analysts such as Abby Cohen of Goldman, Sachs & Co.

Both the Interactive Journal and SmartMoney offer stronger investing coverage than information about other issues such as mortgages. Both sites let you track multiple portfolios, although each site's portfolio is different. We preferred the SmartMoney version, because it presents more relevant information, although you

Quicken.com helps identify your insurance needs and provides quotes and contact numbers.

QuickenMortgage's primary tool is a loan prequalification worksheet, which produces a comparative analysis of closing and monthly costs that you can forward to lenders in your area. You can also calculate how much house you can afford and whether refinancing is worthwhile, then search for the latest local interest rates.

The site's discussions of retirement-plan options and insightful articles make the section very useful for those who are just getting started on retirement planning. You begin with a worksheet that identifies goals and computes a model investment portfolio. The section provides a growth calculator, but it doesn't include taxable investments in its computations.

Quicken.com's tax section includes a tax estimator and calendar, tips, and book excerpts. The site also has a number of useful links to other sites and bulletin-board discussion groups on topics like tax shelters and the new Tax Act.

We found Quicken.com to have many strengths and few significant weaknesses (such as the lack of e-mail notification). The site is an obvious choice for those seeking a one-stop solution.

“

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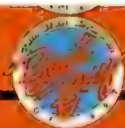
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Online trading is here, which means that unlucky investors now have their computers to hurl out the window rather than themselves the next time the market goes bad. We consider the best three sites for investors who don't have preexisting real-world brokerage relationships.

DLJdirect (www.dljdirect.com) is the online brokerage service of Donaldson, Lufkin & Jenrette, a major player outside cyberspace. You get real-time quotes, and no initial deposit is required. The commission on stock transactions is \$20 per trade for up to 1,000 shares (plus 2 cents for every additional share).

Orders are entered via drop-down boxes, and help is available from every page. Other perks include the ability to withdraw cash from available funds in your account and free check-writing privileges.

Real-time quotes will set you back \$30 a month at **E*Trade** (www.etrade.com), but cut-rate commissions (\$14.95 for up to 5,000 shares, 1 cent for every additional share) and a relatively small initial deposit (\$1,000) help make up the difference. The site's customizable market page gives you the information you want each time you log in.

E*Trade's interface and graphics are the best of the lot. You get color-coded tables for an at-a-glance take on how your investments are doing. Portfolio valuations are updated throughout the day and not just nightly.

The **Web St.** site (www.webstreetsecurities.com) has all of the standard trading features, but what makes the site noteworthy is a Java applet that automatically updates quotes in real time. It's a nifty feature, though it costs an additional \$29.95 a month for account holders.—AC

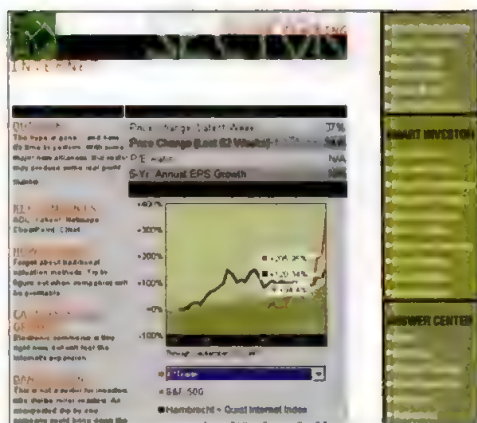


can export Interactive Journal portfolio information as either comma-delimited or text files, which is great if you are a Money or Quicken user.

Neither site offers stock-selection tools, although the Interactive Journal does offer useful "briefing books" for individual stocks. The books contain descriptive information about companies and their markets and condensed analyst ratings and estimates from Zacks'. Stock graphs go back five years but can't be configured by the user, although they can be at SmartMoney.

Mutual-fund investors will appreciate SmartMoney's mutual-fund analyzer, which reviews your current investment holdings and recommends additional fund investments. SmartMoney doesn't rate funds less than three years old, limiting the tool's utility.

Individual fund information is plentiful, but all subjective ratings are home-



SmartMoney Interactive's sector tracking evaluates market categories fairly thoroughly.

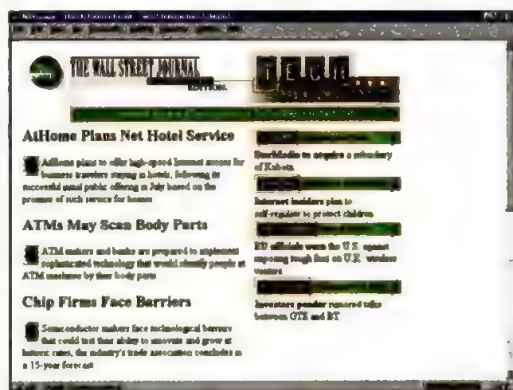
Wall Street Journal Lifetime Guide to Money, a book assembled by the Wall Street Journal Personal Finance staff. Access to content is organized by category and divided into three broad age groups (such as "40s and 50s"). You select topic and age group and the site returns a three- or four-page overview of relevant considerations.

The Interactive Journal's content provides little direction and is too static. SmartMoney does a bit better; it provides interactive tools, but they are not exemplary. The site's retirement-planning worksheet stands out by not focusing on future yearly contributions, but we found its recommendation to save roughly 80 percent of take-home pay this year a laudable but somewhat unrealistic goal.

SmartMoney's mortgage calculator is easy to use, but the mortgage section doesn't let you find local interest rates, peruse real-estate listings, or contact a broker. At the time we tested, SmartMoney addressed only estate taxes and not income taxes.

The insurance section in SmartMoney includes worksheets for computing disability and life-insurance needs and links to online quote sources, but you don't get what Quicken.com offers—help in figuring out what kind of insurance you need and the opportunity to prequalify. Our recommendation: Go for the news content and look elsewhere for tools.

The Wall Street Journal Interactive Edition and **SmartMoney Interactive**. Price: \$49 a year, \$29 a year for print subscribers. www.wsj.com, www.smartmoney.com. PC



The content available at the Interactive Journal is what makes it worthwhile.

grown, with no additional recommendations from noted authorities such as Morningstar. Still, most fund shoppers can benefit from SmartMoney's volatility statistics and other hard-to-find information, such as stock-turnover ratios. Mutual-fund data on the Interactive Journal consists of minimal historical price information and basic ratings against similar funds.

The Interactive Journal and SmartMoney are particularly weak in tools relating to other life-planning topics, such as insurance, home buying, retirement planning, and tax preparation. The Interactive Journal provides some simple worksheets, but the information is largely composed of excerpts from *The*

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UNIX WORKSTATIONS FROM SILICON GRAPHICS AND SUN MICROSYSTEMS

Workstations

IS RIGHT FOR YOU. *By David S. Linthicum*

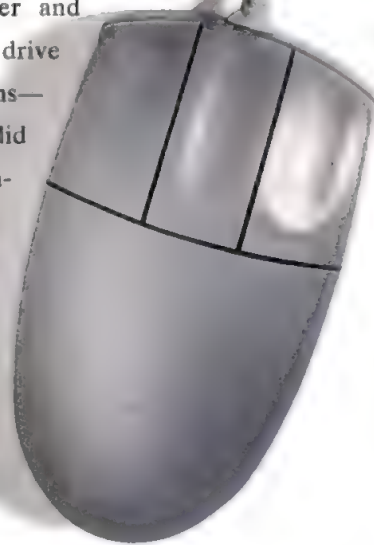
It finally happened. When no one was looking, high-end Wintel-based computers jumped past the muscle-bound low-end Unix workstations on the market today. This was no surprise to the hordes of Windows NT users who have seen features and processors double in power every year, but traditional workstation advocates may need time to adjust. Application vendors are already sensing the opportunity and have begun the migration of high-end graphics applications, such as animation and mechanical drawing, to Windows NT for the Intel CPU. The question is, will this trend continue?

THE WAY THINGS WERE

High-end workstations were once the exclusive domain of the big Unix workstation vendors such as SGI (Silicon Graphics Inc.), Sun Microsystems, IBM, and Hewlett-Packard. These companies created the workstation space and introduced many of its standards, such as OpenGL, which started at SGI. Their

workstations run high-resolution graphical niche applications, such as data visualization, CAD/ CAM (computer-aided design/ manufacturing), and animation applications that gobble up graphics memory and CPU cycles. Almost all of these graphics applications use 3-D graphics and require high-performance resources.

In the recent past, PCs simply could not provide the processing power and graphics subsystems to drive these graphics applications—and prior to this year they did not even have the applications. Unix workstations did, and in many circles they still own the world of high-end graphics applications, such as animation. And Sun still has the lion's



share of the workstation market.

Things, as always, are changing. With the advent of the Pentium II processor, multiprocessing and multithreading operating systems such as Windows NT, and new high-end peripheral devices such as 3-D accelerators and graphics coprocessors, we can now configure PCs that blow the doors off traditional workstations in the same price range.

It's still too soon to declare the world of non-Intel workstations dead. PCs still can't provide the same degree of scalability. Unix workstations run the same applications and operating environments on computers that have over a dozen processors, as well as gigabytes of memory and storage (with commensurately high prices). Win-

the IBM IntelliStation M Pro, the Intergraph TDZ 2000 3D Graphics Workstation, the Micron Powerdigm XSU, and the NeTpower Symetra3 are Pentium II-based systems running Windows NT 4.0. The Alpha-based Digital Personal Workstation 500a also runs Windows NT 4.0. The MIPS R10000-based SGI O2 R10000 runs Irix 6.3, and Sun's UltraSparc II-based Sun Ultra 30 runs Solaris 2.6. All of the tested systems were 3-D-enabled through either on-board architectures, as in the case of the SGI O2 R10000, or third-party 3-D graphics coprocessors, as with the Intel systems.

We originally sought workstations in the \$15,000 to \$20,000 price range. Some vendors, however, do not have Intel-based offerings in that range, but we reviewed

a turning point in the workstation industry: Intel-based systems kept up with and often surpassed machines from traditional workstation vendors.

The speed demons of the bunch were the Digital, HP, and Intergraph systems. The Intergraph unit had a balanced design with an excellent OpenGL graphics subsystem; it proved the best all-around 3-D workstation we tested. The HP unit pulled ahead on our Winstone tests and was the best 2-D workstation. The Digital box was able to run most applications faster than the Intel crowd (by a substantial margin in some cases) thanks to its excellent floating-point performance, which helped it on tests that involve sophisticated image filtering and complex 3-D rendering. That level of performance, however, is available only if you're running native Alpha applications.

The Sun unit had better floating-point performance than the Intel-based systems and did well with rendering simple shaded 3-D scenes. The SGI model fared poorly on most of our tests but, with its Unified Memory Architecture (UMA), showed good scalability in handling texture-heavy scenes.

NT, SOLARIS, AND IRIX—OH, MY!

When evaluating workstations you have to consider application support. If there is an application you must run, you may not have a choice of machine. Ports are under way, but some workstation applications are still available only on the Unix platforms; many high-end or vertical-market applications are likely to remain Unix-only for some time. Conversely, the latest version of AutoCAD, Release 14, was designed specifically for Windows 95 and Windows NT, and further versions will not be ported to other platforms. Applications such as 3D Studio Max are not available for the Digital, SGI, or Sun systems at all. What's more, each application is created on each platform using very different development techniques and technology; not all are well optimized. The bottom line: Consider your application before choosing a platform.

You must also consider operating sys-

and cross-platform availability. We evaluated floating-point and integer abilities, disk subsystems, and such graphics functions as texture mapping, OpenGL and polygon rendering, and more.

PERFORMANCE

Intel-based systems have always provided good value but not performance. Our tests prove this is no longer so, and that 1997 was

Intel x86 workstations have surpassed machines from traditional workstation vendors.

dows NT-based PCs may be able to cluster their way to the same degree of scalability very soon. But high-end non-Intel beasts have provided this kind of power for some time. Thus, if you need scalability, traditional Unix workstations such as the SGI and Sun units are currently a better bet.

REVIEW CRITERIA

For this roundup, we requested Windows NT- and Unix-based workstations from select vendors. For the x86/Windows NT group, we asked for dual Pentium II/300 CPUs, 128MB of RAM, 8GB of storage, and OpenGL-based graphics cards with 24MB of RAM (or more). We also acquired non-x86 systems from Digital Equipment Corp., SGI, and Sun; these units each have a single processor, however.

We did not review Apple Computer's current dual-processor workstations because they use the PowerPC 604e 200-MHz CPU and are based on older technology than the Umax unit we reviewed in our last workstation roundup (April 22, 1997). Umax has not significantly changed its system from the unit we last reviewed, and DayStar is out of the Apple-clone market.

Our filter netted us nine workstations. The Compaq Professional Workstation 6000, the HP Kayak XW PC Workstation,

their units because they still met our criteria. The Intel-based units ranged in price from \$8,359 for the Micron Powerdigm XSU to \$20,570 street for HP's Kayak XW. The Alpha and Unix systems were priced from \$13,000 to \$17,500.

We tested using a combination of some of our Wintel-compatible ZD Winstone 98 and WinBench 98 benchmark tests, and graphics applications that support most or all of the systems. The graphics applications we used were Adobe Photoshop, AutoCAD, AVS Express, Pro/Engineer, Softimage 3D Extreme, and 3D Studio Max; they were selected for their market position

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For an interactive version of this review of nine Windows NT and Unix workstations, please join us online.

Our Contributors: DAVID S. LINTHICUM is the chief technology officer of Software AG Americas, a consulting firm. NICK STAM is a technical director of PC Magazine Labs. ROBERT A. ANTHONY is a senior staff writer and CADE METZ is a staff writer for *PC Magazine*. PATRICK NORTON is a freelance writer. ANUSH YEGYAZARIAN was the associate editor in charge of this story, and S. JAE YANG was the project leader.

tems. Windows NT uses the Win32 API, which it shares with Windows 95, and which has an abundance of mainstream applications. High-end graphics applications are also being ported to the Intel-based Windows NT platform to meet the demand. That makes an NT unit a very good value if you want one box to handle all your work.

Although the Digital unit runs Windows NT compiled for the Alpha, it does not run Windows 95 or Windows NT compiled for the x86. As with the SGI and Sun platforms, if you want to run Windows applications on an Alpha machine, you can't do it without some translation. In Digital's case, you have FX!32 technology, which derives Alpha code from x86 instructions. This is faster than traditional emulation software, such as WABI (Windows Application Binary Interface) from Sun or SoftWindows from Insignia Solutions for other Unix machines, but you don't get the performance of native applications, and you may not be able to run some of your applications at all.

Ease of software installation across platforms can vary as well. While our Windows NT-based computers provide good old Setup.exe, often invoking the friendly Install Shield utility, the Unix systems require you to deal with far more complicated installation routines. License managers are troublesome across all platforms for higher-end applications with limited market share and high price tags. These managers are essentially software piracy prevention mechanisms that require one or more codes to get an application up and running. Software vendors consider these mechanisms a necessary evil, but users despise them for their maintenance hassles.

Where SGI and Sun have a marked advantage is in the stability of their operating systems. Unix has been around far longer than Windows NT and has had a chance to mature. That may be the deciding factor for IS managers.

WHERE TO NOW?

Windows NT and the Pentium II have revolutionized the way we look at workstations. As our tests show, high-end Windows NT workstations can run not only commodity software but graphics applications as well. And the processor power from the Wintel camp won't stop at the Pentium II: 64-bit CPUs such as the



• Intergraph TDZ 2000 3D Graphics Workstation



The workstation market is no longer the province of traditional Unix-based systems. Applications are being ported to the Wintel-compatible world, and the

power is already there, as proven by our Editors' Choice winner: the Intergraph TDZ 2000 3D Graphics Workstation (\$15,000 street).

The dual Pentium II/300-based TDZ 2000 is a well-balanced system with top performance. Thanks to its two Ultra Wide, 10,000-rpm SCSI hard disks configured in RAID 0 and its Intergraph Realizm II VX25 OpenGL graphics card, its scores were at or near the top on each of our tests. No doubt this level of excellence was aided by the geometry accelerator (\$1,530 list) that Intergraph added to the graphics card.

The TDZ 2000 comes with plenty of free bays and expansion slots, and there is an external TowerMate option in case you need additional room. The unit comes with Intel's LANdesk Client Manager and is DMI 2.0-compliant. It also has 128MB of ECC SDRAM and a 21-inch monitor; the unit is backed by 24-hour, 7-day technical support and a three-year warranty.

The Digital Personal Workstation 500a (\$12,960 street) merits an honorable mention. Thanks to its powerful Alpha 21164/500 CPU, it garnered scores at or near the top on all of our tests; it handled floating-point-intensive tasks especially well. Be aware, though,

that you need native applications to get this performance level. Major business productivity applications from companies such as Corel and Microsoft have been ported recently, but popular native applications for the Alpha are still relatively scarce.

The IBM IntelliStation M Pro (\$10,800 street) also merits an honorable mention. The unit is a good, cost-effective solution, offering nearly the same level of performance as the Intergraph system on some tests and strong results on the others. It is at its best performing 2-D tasks, and it has solid 3-D OpenGL rendering capabilities with simple textures. The unit is DMI 2.0-compliant and comes with a comprehensive desktop management package.

The SGI and Sun units are competitively priced and in fact are less expensive than our top Windows NT-based performer, but they could not keep up on our tests. Overall, the Sun unit fared much better than the SGI. The principal advantages they both still offer are scalability and stability of platform.

Despite recent ports, not all workstation applications are available for the Intel/Windows NT platform. If you're bound to one application and it's available on only one platform, your decision is made.

Merced chip using Intel and HP's new IA-64 architecture will be shipping by 1999.

Traditional workstation vendors won't allow Wintel to suck up their market without a fight and new products are about to hit the streets. IBM, for instance, is introducing a new RS/6000 RISC-based Unix workstation that runs at 333 MHz and provides enhanced graphics features superior to PCs (so the company claims). IBM is also willing to discount its work-

stations deeply to better compete.

Sun is making changes as well, bringing many high-end boxes within reach of those now considering Intel-based computers. The new UltraSparc II-based Ultra 5 and the Ultra 10, for instance, are going to sell for under \$5,000 and under \$10,000, respectively, by the time you read this. SGI is already deeply discounting models in its O2 line to prices below those of many Intel boxes. These trends will continue.

It will be interesting to see how vendors that support both Intel and non-Intel workstations handle the changing market. Vendors such as HP and IBM currently seem to use the same strategy: Offer Intel systems at the lower end while aiming Unix machines at the high end.

The PC is not going to give up its new high-value position in the market. The real data point will be the number of high-end graphics applications that move to Windows NT now that the platform is popular. Even the most powerful workstations won't attract customers if there is no software that runs on their platform—or if other options offer less risk.

In the future, and as traditional graphics workstations become obsolete, we believe IT organizations will continue to see the value of switching to the new generation of Intel-based graphics workstations. Wall Street is already replacing the once omnipresent Unix workstations with Intel-based solutions. The fact is,



Like any proper corporate box, the unit has a tool-free, lockable chassis. Two of its six interior compartments are devoted to disk drives: One holds four front-accessible 5.25-inch bays, the other six 3.5-inch internal bays. The internal bays, which hold two relatively slow, 7,200-rpm Ultra Wide SCSI disks, are lined with plastic rails

for easy removal. Two front bays are taken, one by a floppy disk drive and the other by a 16X CD-ROM drive, but there is room for expansion.

Two other compartments contain removable component "cages"—one for processors and one for expansion cards. These cages, whose horizontal circuit boards plug into a vertical board, can be removed by pulling levers in the rear of the machine. The expansion cage offers two PCI slots and four shared slots. It also has a SCSI adapter, an external SCSI port, a Netelligent 10/100 TX controller, and two USB ports.

The processor cage makes CPU upgrades easy. Its circuit board has two slots designed to accept proprietary processor cards, each of which holds a Pentium II and its heat sink. The board also contains 4 DIMMs and a slot designed to accept a memory upgrade card. The tested system had 128MB of ECC SDRAM (the maximum is 1GB).

Compaq had intended for PC Labs to test the unit with its leading graphics card option, the Diamond FireGL 4000, but—because of a series of operational difficul-

ties—we used the company's lower-end 3-D ELSA card instead. With the ELSA GLoria-XL 3D graphics controller installed, this machine was among the slowest x86 systems. Its High-End Winstone 98 and Graphics WinMark 98 scores were below average and surpassed only the scores of the Micron Powerdigm XSU. Using 7,200-rpm rather than 10,000-rpm drives, its Disk WinMark 98 result was about 25 percent below the mean. The system performed no better during application testing. It was particularly inept during disk-

intensive tasks—our Pro/Engineer and RGB-to-CMYK Photoshop conversion tests—as well as on our graphics-heavy 3-D Studio Max tests.

If you can put performance aside, the Compaq unit still has things to offer. In addition to a well-designed chassis, it ships with Compaq's SmartStart Workstation CD (for quickly reconfiguring the system) and Insight Manager DMI software (for managing and monitoring the system from a remote console). Compaq even provides USB ports on its 21-inch monitor (\$1,800 street, included in the above price). The unit comes with Compaq's prefailure warranty on the memory and hard disks, plus a three-year-parts, one-year-labor warranty, with a year's on-site service and round-the-clock technical support.—Cade Metz

Compaq Professional Workstation 6000. Street price: \$9,360. Compaq Computer Corp., Houston; 800-345-1518, 281-370-0670; fax, 281-518-1442; www.compaq.com. Choose 521 at www.pcmag.com/infolink.

Digital Personal Workstation 500a

Digital Equipment Corp.'s Alpha design offers the most raw computing power available for Windows NT, as long as you have native applications. In fact, the Digital Personal Workstation 500a (\$12,960 street) outperformed almost every other system we tested, using its single 500-MHz Alpha 21164 processor. Each of the other Windows NT-based systems used two Pentium II/300 CPUs.

The Alpha 21164-based unit outperformed well-balanced Pentium II-based systems, such as the HP and Intergraph units, by a small margin in most cases. Still, on some tests, such as our single-



traditional workstation vendors are deeply discounting prices to compete.

support for multiple kinds of applications is a real value proposition for these shops.

Our guess is that most of the non-Intel workstation vendors will either move quickly to provide x86-based solutions for low- and mid-price workstations or just retire from that market. If you can't beat 'em, join 'em—or just give up.

Compaq Professional Workstation 6000

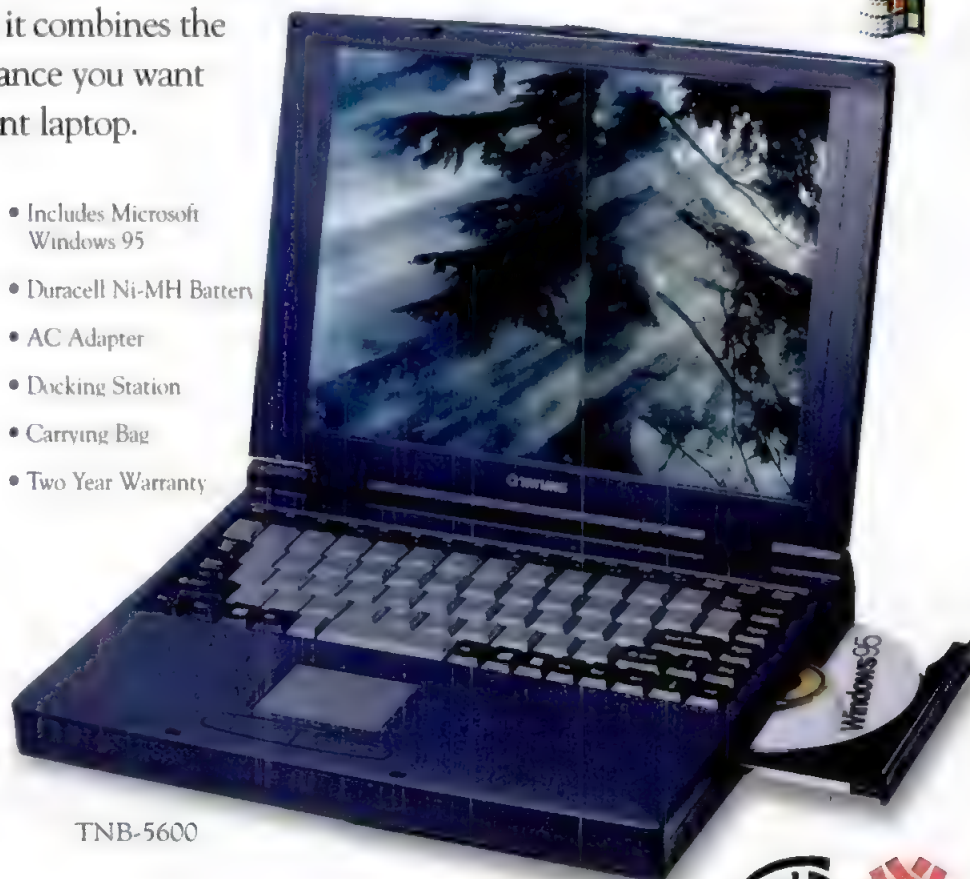
Compaq launched its dedicated workstation division in August 1996, and with the Compaq Professional Workstation 6000 (\$9,360 street), it has created the PC market's most innovative chassis design. Of the nine systems in our roundup, this machine, which is divided into six self-contained component compartments, is certainly the easiest to upgrade and repair. It is not, however, particularly fast; it came in near the bottom on most of our tests, thanks to its comparatively slow hard disk, graphics, and memory subsystems. Compaq positions this dual-Pentium II/300 workstation as a CAD-modeling, video-editing, and 3-D animation tool.

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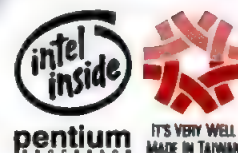
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threaded floating-point-intensive AVS/Express Volume Ray Tracing test, it ran nearly twice as fast as Pentium II systems. It did not score quite as well on our Soft-Image OpenGL rendering tests, but it was still highly capable. The Digital unit's excellent floating-point performance should be especially welcome for those working with color reconfiguration, and modeling and rendering of complex 3-D scenes.

There are a number of caveats to the Alpha processor, first and foremost that it delivers that monster performance only if you have native Alpha applications. The platform has been bolstered recently by announcements from Corel, Microsoft, and Quark that popular applications such as WordPerfect Office, Microsoft Office, and QuarkXPress would be ported to the Alpha. Nevertheless, the number of mainstream and workstation applications available for Alpha is still drastically smaller than that available for other platforms.

Digital's FX!32 software provides better execution of nonnative code than most software of this type, because it doesn't emulate x86 code—as emulation packages do—but actually derives Alpha code from the x86 application instructions. A revision of the product last October made it easier to install and added support for more applications, but performance is limited. And it will take time and training for the software to perform its conversion.

The recent sale of Digital's Alpha fabrication facility to Intel as part of the settlement of Digital's patent infringement suit against Intel raised questions as to the

Alpha CPU's fate. Digital retains control of the Alpha design, and Intel is contractually bound to provide Alpha processors for the next decade. Digital has also said it will continue to develop the processor (the next version, Alpha 22164, is due out later this year). Mitsubishi and Samsung also still hold rights to sell Alpha CPUs.

The system uses Digital's Pyxis chip set, which provides a 128-bit memory bus to the memory controller, which feeds into the 64-bit CPU. The unit can pack up to 2MB of L3 cache beyond the 96K L2 inside the CPU. Maximum system memory is 1.5GB. Though the unit has a case that's especially easy to open, it doesn't offer a lot of opportunities for component expansion. Just two drive bays are open. Of the three ISA/PCI slots and two 64-bit PCI slots, one of the shared slots is filled by an Adaptec 2940UW SCSI controller. The Intergraph 4D60T graphics accelerator fills both 64-bit slots, though it isn't a 64-bit card. They were the only two PCI slots close enough to fit the two-slot device.

The motherboard design is excellent. There is no need to detach any internal cables to replace it; you simply pull the external cables from the back of the system, flip two levers, and slide it out. The unit also has a 100/10Base-TX Ethernet port. The 21-inch monitor is an option (\$2,180 street, included in the above price).

If the applications you need are available in native Alpha ports and their performance hinges primarily on CPU horsepower, consider an Alpha system. Also keep in mind that there are a number of less expensive Alpha-based units available through direct mail providers such as Enorex or Polywell.—Patrick Norton
Digital Personal Workstation 500a. Street price: \$12,960. Digital Equipment Corp., Maynard, MA; 800-344-4825, 508-493-5111; www.workstation.digital.com. Choose 522 at www.pcmag.com/infolink.

HP Kayak XW PC Workstation

The chassis of the pricey HP Kayak XW PC Workstation (\$20,570 street) isn't as dramatic-looking as that of the Intergraph TDZ 2000 3D Graphics Workstation, but the Kayak XW's performance on our tests was nearly as good. In fact, it outperformed the Intergraph system on our High-End Winstone 98 tests and delivered the best 2-D performance in this roundup. The Kayak XW doesn't offer a lot of space for expansion, however. It is HP's top-of-the-line Windows NT workstation (the PA-RISC workstations are the next step up) and is meant for mechanical CAD, multimedia creation, and scientific visualization tasks.

The Kayak XW's densely packed case opens like a giant puzzle. The HP-designed motherboard is fairly easy to remove once you've pulled out the giant "scoop," part of HP's UltraFlow cooling system, which directs air over the pair of Pentium II/300 CPUs. The modular design requires that you remove at least one other part to access most components, however. The unit also came with HP's excellent management software Top Tools 2.5, which allows monitoring of components, remote BIOS upgrades, remote component locks,



remote power-on, hardware monitoring, and chassis intrusion.

The unit's 128MB of ECC SDRAM takes up a pair of DIMM slots, leaving two slots for upgrading (the system's maximum is 512MB). While the expansion slots are easy to access, only a single ISA slot and a shared PCI/ISA slot were open in our test-



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BENCHMARK TESTS

Graphics Workstations



Workstations are about speed and power. The Intergraph TDZ 2000 3D Graphics Workstation, with its dual-Pentium II/300, impressed us

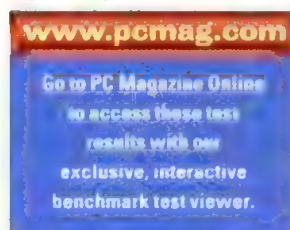
with great all-around performance, while the raw processor power of the Alpha chip in Digital's workstation was unmatched.

What the Numbers Mean

With the advent of the Intel Pentium II, x86 workstations have come of age and offer formidable competition to low-end Unix workstations. In this roundup, the SGI O2 R10000 was outperformed by the x86 lot. The Sun Ultra 30 held its own on some tests but paled in comparison with the top Windows NT units. The HP Kayak XW PC Workstation was a strong Pentium II-based system. The design of the Micron Powerdigm XSU lacks balance: Its excellent hard disk but erratic graphics subsystem yielded inconsistent performance. The IBM IntelliStation M Pro's scores were consistently average. Both the Compaq Professional Workstation 6000 and the NeT-power Symetra3 were impeded by slow hard disks.

We ran comprehensive benchmark tests to evaluate whole systems, as well as component-stressing tests that isolate key performance attributes in 2-D and 3-D graphics workstations. Floating-point performance gives rise to strong physics modeling, color reconfiguration, and modeling and rendering of complex 3-D scenes. A good integer processor helps 2-D image filtering and general computation. Strong OpenGL performance benefits visual engineering applications, mechanical CAD, 3-D modeling, and simple animation. Rapid texture mapping aids in speedy rendering of photo-realistic 3-D scenes.

AVS/Express There are two components to the AVS/Express tests, which we ran on every system in the roundup. We tested OpenGL performance (or XGL for Sun) at various texture modes.



First we tested with no texture to measure the shading, lighting, and geometry-processing capabilities of the systems. Then we progressively stressed the systems by adding 2-D and 3-D textures, which require more rendering calculations and some transfer of texture data from the system memory to the graphics

card. We also ran the Volume Ray Tracing test, which is the only way for us to isolate and compare the floating-point performance across all the platforms here.

	AVS/Express No Texture (frames per second)	2-D Texture (frames per second)	3-D Texture (frames per second)	Volume Ray Tracing (seconds)
Compaq Professional Workstation 6000	24.3	14.9	1.97	47.2
Digital Personal Workstation 500a	49.7	36.8	3.71	22.9
HP Kayak XW PC Workstation	45.4	8.0	4.36	47.1
IBM IntelliStation M Pro	45.7	10.1	2.24	46.9
Intergraph TDZ 2000 3D	67.4	16.6	5.28	47.1
Micron Powerdigm XSU	31.4	26.2	6.19	43.2
NeTpower Symetra3	15.8	13.3	1.76	48.1
SGI O2 R10000	18.7	12.4	0.02	38.9
Sun Ultra 30	38.1	9.2	N/A**	30.7
	BETTER >	BETTER >	BETTER >	< BETTER

	Softimage 3D Extreme Mental Ray Renderer (minutes:seconds)	OpenGL: 256 x 195 (seconds)	OpenGL: 640 x 480 (seconds)	OpenGL: 1,024 x 768 (seconds)
Compaq Professional Workstation 6000	7:00	14.6	39.8	82.6
Digital Personal Workstation 500a	5:23	11.1	37.4	82.0
HP Kayak XW PC Workstation	6:59	17.8	61.5	139.5
IBM IntelliStation M Pro	6:56	10.4	26.3	52.2
Intergraph TDZ 2000 3D	6:54	10.3	25.0	48.9
Micron Powerdigm XSU	7:19	13.3	58.0	136.3
NeTpower Symetra3	7:04	9.7	32.6	71.4
SGI O2 R10000	7:12	18.3	38.4	66.4
Sun Ultra 30	N/A*	N/A*	N/A*	N/A*
	< BETTER	< BETTER	< BETTER	< BETTER

N/A*—Not applicable. The application software is not available for this platform.

N/A†—Not applicable. The product could not complete this test.

Again, all x86-based systems had nearly identical floating-point performance except the Digital workstation, which had a timing 30 percent shorter than the average on the Mental Ray Render test. As the resolution of the OpenGL test clip increased on the OpenGL tests, the Intergraph and IBM workstations soared in relative performance. The SGI system with a unified memory architecture also scaled well with added stress. On an informal test, the multithreaded Mental Ray Renderer took about 20 percent longer on a single-Pentium II system than on a dual-CPU configuration. We did not see this disparity on the OpenGL tests, which are not multithreaded.

Pro/Engineer Along with AVS/Express, Pro/Engineer was one of the two applications available for every platform represented in this roundup. This comprehensive benchmark test serves as the best tool for system-level comparison of 3-D graphics workstations of various platforms. It stresses CPU, disk, and graphics systems fairly uniformly. But Pro/Engineer is still not multithreaded, and it does not take advantage of dual processors.

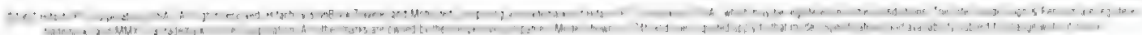
Boosted by the raw horsepower of its 500-MHz, four-way superscalar and superpipelined Alpha 21164 CPU, the Digital workstation came out on top. But it was closely followed by the Pentium II machines from Intergraph and HP, which are well balanced and strong all-around. The Micron and Sun workstations, which have strong OpenGL performance, also fared well, posting timings that were nearly 20 percent shorter than the mean.

AutoCAD, Release 13C4 The AutoCAD tests are a more comprehensive measure of whole-system workstation performance. We tested only the Digital Alpha unit and the Pentium II machines with AutoCAD. AutoCAD is not multithreaded and does not take advantage of dual processors in the x86 systems.

With the generic Windows driver, most systems scored near the average, including the Digital workstation, but the Micron entry took 14 percent longer than the norm, proving its graphics subsystem's inadequacy in handling the Windows GDI. With the Whip driver, the variance among the Pentium II systems almost disappeared, while the Digital workstation distanced itself with a score that shaved 28 percent off the mean timing. In general, the workstations took nearly 100 seconds longer with the Whip driver than with the Windows driver.

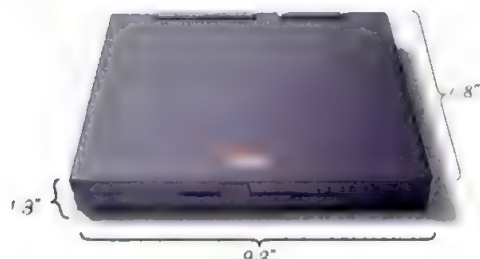
We also invited vendors to provide us with their own optimized AutoCAD drivers. Compaq and Micron responded with custom drivers that brought 60 and 35 percent reductions in test timings, respectively. IBM sent us a Soft Engine driver from Vibrant Graphics that boosted AutoCAD speed by 59 percent.

BETTER



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BENCHMARK TESTS

Although the Windows NT systems can achieve much better AutoCAD performance with Release 14, we do not report those results, because this latest version of AutoCAD supports only the x86 platform and does not lend itself to cross-platform comparison.

Adobe Photoshop Photoshop is a classic workstation application for 2-D image rendering, which heavily taxes the CPU's computing power. We used Version 4.0.1 for the x86 Windows NT systems and Version 3.0.1 for the two Unix systems, for which no later version exists. Although the versions are different, the test results can be compared across the platforms, because the filters used are essentially the same. The only real exception is that Version 4.01 for Windows NT utilizes the MMX SIMD technology. Unlike the High-End Winstone Photoshop test, the applications-based Photoshop tests isolate subsystem characteristics such as MMX (in the case of x86 systems), floating point and integer arithmetic, and multiprocessors.

The Gaussian Blur and Unsharpen Mask tests both stress integer calculation with minimal involvement of the hard disk subsystem. The scores for the Pentium II systems were grouped closely together, as they all use the same processor. The Micron workstation, with its Samurai chip set, lagged slightly behind.

The dual-Pentium II systems took less than half as much time as the two Unix machines on the Gaussian Blur test. Even with only one CPU (results not shown), the Pentium II systems bettered both of the Unix systems on the Gaussian Blur test. The Sun workstation closely matched the Pentium II units on the Unsharpen Mask test, but the SGI system took more than twice the time.

Sun's UltraSparc II, SGI's MIPS R10000, and Intel's Pentium II/300 proved to be nearly equivalent in the floating-point calculations used on the Lighting Effects test.

The RGB-to-CMYK Conversion is a two-pass process that converts an RGB image to the LAB color space, then to CMYK. Because of the added complexity, the process spills over the physical memory and occupies space on the hard disk in converting the 30MB test image. The systems with faster hard disks did well, but with its superior processor and L2 cache architecture, the HP unit shaved 44 percent off the average timing. The test also stresses memory interface; the Compaq system, with its 7,200-rpm disk and inefficient memory subsystem was the worst of the lot. The Sun model has a powerful crossbar memory subsystem, and it took 57 percent less time than the average; the SGI unit also did well, scoring slightly better than average.

We also performed the RGB-to-CMYK Conversion test with a 100MB image. The systems from HP and Intergraph fared extremely well, largely because of their Seagate Cheetah drives.

ZD High-End Winstone 98 and ZD High-End WinBench 98

We ran the familiar ZD benchmark tests only on x86 systems. On our Winstone tests, most of the systems scored close to the average of 30.0. The only deviant was the Micron unit, which scored 22.9—considerably lower than we'd expect from a workstation of this class.

The HP system, thanks to its balanced architecture, had the top Winstone score—35.0. The highlight of the HP unit's architecture is its processor/memory subsystem, as indicated by its top CPUmark₃₂ score. A close second on the Winstone tests went to the Intergraph unit, backed by top-notch graphics and disk subsystems.

The High-End Graphics WinMark tests measure Windows GDI operations. The Intergraph workstation with the Intergraph RealIZm II 3D chip set performed best, followed by HP's entry with the HP Visualize graphics subsystem. Micron's system fared the worst.

Each of the leaders on the Disk WinMark tests—the Micron, Intergraph, and HP units—is equipped with a 10,000-rpm Seagate Cheetah hard disk.

3D Studio Max The 3D Studio Max tests measure OpenGL rendering speed as well as raw texture data throughput. The tests also evaluate the graphics driver's ability to cull nonvisible data. We tested OpenGL rendering at two different scene complexities—20,000 and 100,000 triangles.

The Intergraph workstation showed frame rates that were nearly 50 percent higher than the mean in each of the test scenes, and it showed no performance degradation in going from 20,000- to 100,000-triangle scenes. Its driver also culled the nonvisible scene data much better than most other systems' drivers. The HP unit was also notable for its ability to cull nonvisible data. Workstations from HP, IBM, and Micron had good raw-texture throughput (20 percent above the mean) but still scored about 30 percent below Intergraph. The Compaq and NeTpower systems were the only two that were consistently below average on these tests.—*Analysis written by S. Jae Yang and Nick Stam*

How We Tested

Workstations are typically used for CAD, image processing, 3-D rendering and modeling, data visualization, digital video editing, real-time processing, software development, and many highly specialized scientific and financial software programs. We chose a suite of benchmark tests consisting of some of the most popular workstation applications. When faced with the option, we used common software settings rather than optimized configurations. For example, we compare the AutoCAD performance of each system with the Windows driver, not a driver optimized for the specific system. (We discuss informal optimized driver tests in "What the Numbers Mean.")

To gain a comparative performance perspective across platforms, we developed a set of tests using applications that have native versions available for multiple platforms. Unfortunately, not all of the applications worked across all platforms in native mode. Also, some applications may be optimized for specific platforms, so we test with multiple applications to gain a more balanced perspective.

We considered using some of the industry-standard workstation benchmark tests such as SPECint95, SPECfp95, Xmark93, ViewPerf,

	ZD High-End Winstone 98 Score	ZD High-End Graphics WinMark 98 Score	ZD High-End Disk WinMark 98 Thousands of bytes/sec	ZD High-End CPUmark ₃₂ Score
Bold type denotes first place. Compaq Professional Workstation 6000	28.1	96	3,550	785
HP Kayak XW PC Workstation	35.0	128	4,980	823
IBM IntelliStation M Pro	31.2	119	4,300	785
Intergraph TDZ 2000 3D	32.5	143	5,620	786
Micron Powerdigm XSU	22.9	75	5,820	788
NeTpower Symetra3	29.7	101	4,180	752
	BETTER ►	BETTER ►	BETTER ►	BETTER ►

and GLPerf, developed by the Standard Performance Evaluation Corp., or SPEC (available at www.specbench.org). Past experience, however, has shown that we rarely obtain results equivalent to those provided by the vendors because of the many possible combination of compilers, compiler switches, and benchmark test options.

SETUP AND CONFIGURATION

We tested all workstations as configured by the vendors. We standardized graphics resolution and color depth across all systems to 1,280-by-1,024 true color, with the vertical refresh rate as close to 75 Hz as possible. We tested all systems with 128MB of RAM and at least 24MB of graphics memory (for both frame buffer and texturing), except for the SGI and Sun workstations. The SGI machine implements a unified memory architecture that allows the operating system to allocate the memory dynamically for the system and graphics subsystem, and the Sun system lacked texture memory. We tested the SGI and Sun systems with 195MB and 192MB of RAM, respectively. The SGI unit has more memory to accommodate its unified memory architecture, and Sun's OS has a larger footprint than Windows NT and so requires larger base memory. All systems came with at least 8GB of hard disk storage, except for the SGI and Sun units, which had 4GB and 4.2GB, respectively. We gave vendors the option of setting up their systems with two 4GB or larger disks striped and duplexed in a Level 0 RAID configuration if their systems are typically sold with such a configuration. We upgraded the Windows NT 4.0 systems with Service Pack 3 if the vendor did not supply it. The SGI system ran on Irix 6.3, and the Sun workstation ran on Solaris 2.6.

AVS/EXPRESS, VERSION 3.2

AVS/Express, from Advanced Visual Systems, is a data visualization and analysis program for use in such areas as medical imaging, engineering, and scientific and financial analysis. Via advanced graphics, imaging, visualization, and presentation tools, users can gain insights into large volumes of data. Native graphics hardware acceleration such as OpenGL or XGL can be used, and a built-in software renderer is available in the absence of hardware support.

With the help of Joe Peterson, senior engineer at Advanced Visual Systems, we conducted one set of tests that are rendering-intensive and another test that is floating-point—computationally intensive. In real time we rendered a 3-D weather model with three different levels of texturing—**No Texture**, **2-D Texture**, and **3-D Texture**. We spun the test image on a fixed axis and measured the rate in frames per second (fps) with the built-in fps counter. Performance differences among systems are dictated by 3-D graphics (OpenGL or XGL) hardware acceleration. The last test, **Volume Ray Tracing**, casts rays into a 64-by-64-by-64 cube of volume data that represents a theoretical hydrogen atom. A ray is cast for each pixel in the final image, and the ray passes through *voxels* (small 3-D volume pixels or cubes) in the space of the larger volume. Each voxel traversed at each pixel is taken into consideration in the

calculations in order to make a picture of the data in the atom. We report the amount of time that each machine took to complete these calculations. This test is highly floating-point-intensive and uses no 3-D (OpenGL) hardware. Because this test is sensitive to the screen resolution, we set every tested system to 1,280-by-1,024.

SOFTIMAGE 3D EXTREME, VERSION 3.51

Softimage 3D Extreme, from Softimage Corp., is a high-end 3-D animation product that provides many advanced functions including animation and dynamic simulations, enhanced relational modeling, flexible motion capture, inverse kinematics, B-splines, NURBS (nonuniform rational B-splines), object instantiation, real-time deformations, ray tracing, custom constraints, and polygon reduction. It also supports numerous gaming features. The Extreme version includes the Mental Ray renderer for complete and customizable photo-realistic rendering. Softimage is available only for the Windows NT platform.

We performed two types of renders with Softimage. The testing methodology was developed by our consultant, Glenn Menin, with Microsoft's help. We first used the multithreaded **Mental Ray Renderer** (software renderer) to render a 25-frame 3-D test clip at 1,024-by-768, then we rendered the same test clip using the **OpenGL** hardware renderer at three different image resolutions—260-by-195, 640-by-480, and 1,024-by-768, all with 256 colors—to measure the performance scaling against the stress level. We report the time each system took to complete each test.

PRO/ENGINEER, Release 18.0, Version 9733

Pro/Engineer, from Parametric Technology Corp., is the leading mechanical CAD (MCAD) software package. Geared for all stages of product design through final manufacturing, "Pro/E" lets users sketch product features, create relations among various parts (all models are parameterized), assemble components using selected commands, create drawings and views, attach surfaces to parts and assemblies, and render 2-D and 3-D views of assemblies and products.

We ran a **Trail File** test (similar to a macro that automates functions), created by Parametric Technology, that designs a portable music player. The test included parts design, assembly, multiple 2-D views, and 3-D rendering operations. All system hardware was exercised, although the test—which uses both integer and floating-point math—heavily stresses CPU and memory operations. We timed each unit as it executed the entire Trail File. This test used OpenGL graphics hardware on all tested systems.

AUTOCAD, RELEASE 13C4

Autodesk's **AutoCAD** is the most popular mass-market CAD package. We ran the AutoCAD tests for the Alpha and x86 platforms only, because Autodesk claims that AutoCAD will be developed only for these two platforms beginning with Release 14. SGI and Sun did not wish their workstations to be tested with AutoCAD.

Bold type denotes first place.
Frames per second

	3D Studio Max				
	Scene 1	Scene 2	Scene 3	Scene 4	Scene 5
Compaq Professional Workstation 6000	8.3	3.3	6.5	8.0	9.1
HP Kayak XW PC Workstation	18.5	7.3	14.5	12.6	17.5
IBM IntelliStation M Pro	15.8	3.9	13.5	9.1	18.8
Intergraph TDZ 2000 3D	23.7	6.8	19.9	14.2	21.8
Micron Powerdigm X5U	18.2	2.5	14.6	9.3	17.9
NeTpower Symetra3	9.5	3.2	9.1	6.7	10.6
	BETTER ►	BETTER ►	BETTER ►	BETTER ►	BETTER ►

BENCHMARK TESTS

Our AutoCAD tests consist of a combination of AutoCAD script files and AutoLISP subroutines. We test three functional areas: opening 2-D and 3-D drawing files; performing 2-D manipulations such as new entity additions, entity deletions, undo commands, regens, zooms, and pans; and 3-D manipulations, which combine 3-D view rotations and alterations, the Hide command, 3-D move operations, and a variety of rendering variations. CPU, disk, and graphics subsystems are all heavily stressed. We timed each system as it performed our scripts with both the **Whip Driver** and the **Windows Driver** for AutoCAD, Release 13C4. We also performed informal tests with an optimized AutoCAD driver if one was available for a given test system.

ADOBE PHOTOSHOP

For the **Adobe Photoshop** tests, we used the latest available revision on all platforms. We tested the x86 systems with Version 4.0.1 (with upgrades for MMX); for the SGI and Sun systems we used Version 3.0.1. There is no version of Photoshop ported to Digital's Alpha platform. Our test consultant, Glenn Menin, worked with Adobe engineers to develop the tests. We timed the application of three filters and an RGB-to-CMYK conversion. The **Gaussian Blur** and **Unsharpen Mask** filter tests stress integer math. The **Lighting Effects** filter test stresses system floating-point capabilities. And the **RGB-to-CMYK Conversion** tests stress the CPU, L2 cache, and memory subsystem. For the Pentium II-based units, the Gaussian Blur, Unsharpen Mask, and RGB-to-CMYK Conversion tests utilize the MMX instructions for SIMD (single instruction multiple data) operations to varying degrees. The radius setting of 10 we chose for Gaussian Blur minimized the effect of MMX for that particular test. The Gaussian Blur, Unsharpen Mask, and RGB-to-CMYK Conversion tests take advantage of dual CPUs.

In order to isolate the performance of the processor and memory architecture of each system, we chose a 30MB test image so that most of the operation was done within the physical memory. We allotted 81MB of system memory to Photoshop in all tested systems. To measure performance involving the hard disk, we repeated the RGB-to-CMYK Conversion test with a 100MB image.

ZD BENCHMARK TESTS

The **ZD High-End Winstone 98** benchmark test program measures the time an x86 PC takes to execute a set of application scripts that exercise seven Windows NT applications. The program weights a given machine's seven timings equally, then derives a

composite number and converts that to a relative score. (The score is relative to the performance of a Dell Dimension Pentium/133 with 32MB of RAM, at 1,024-by-768 resolution with 16-bit color, running Windows NT 4.0 with Service Pack 3. The base score is defined as 10.)

Using **ZD High-End WinBench 98**, we measured the x86 systems' graphics, disk, and processor subsystem performance. The **ZD High-End Graphics WinMark 98** score is based on a log of GDI operations used in the High-End Winstone tests and represents the performance of each machine's graphics subsystem under Windows NT 4.0. The score is normalized to reflect performance relative to the base system used for Winstone testing. The **ZD High-End Disk WinMark 98** score is based on a log of disk functions used in the High-End Winstone tests and represents the performance of each machine's disk subsystem under Windows NT 4.0. Results are recorded in thousands of bytes per second, then converted to a harmonic mean, which is then weighted by the same method used for the High-End Winstone tests. The **ZD CPUmark₃₂** scores reflect the speed of each PC's processor subsystem, which includes the CPU, RAM, and secondary cache, under a 32-bit operating system. This test emulates the CPU activity of real-world 32-bit applications.

3D STUDIO MAX, R2

Kinetix's 3D Studio Max is a 3-D modeling and animation package developed specifically for Windows NT. The software is popular among professionals involved in film and video production, game development, and interactive content authoring. This platform supports both the OpenGL and Direct 3D APIs.

We chose five of the scenes provided on the 3D Studio Max CD to test the x86 workstations in accelerating OpenGL 3-D rendering. **Scene 1** displays three objects consisting of 20,000 triangles lit by two spotlights. **Scene 2** is similar to Scene 1, but only one of the objects is visible. This scene tests how well the graphics driver culls the nonvisible scene data. **Scene 3** displays the same three objects but with increased object complexity, at 100,000 triangles. The results from this scene compared with Scene 1 indicate how well the graphics system scales in performance with rising complexity. **Scene 4** displays only a part of the objects in Scene 3. Like Scene 2, Scene 4 tests how well the driver culls nonvisible scene data. **Scene 5** displays one fully viewable 20,000-triangle object to test the raw texture-rendering performance. We measured playback in frames per second.

ed unit. The HP Visualize fx4 graphics subsystem takes up both a PCI and the AGP slot, while a 10/100 Base-T Ethernet card takes up another, and an Adaptec ARO-1130A RAID controller card with 16MB of RAM occupies the 64-bit PCI slot. Drive bays are slightly less of a problem: the two 4.3GB hard disks configured in Raid 0 occupy two bays, leaving three open.

The system has two USB ports, an Ultra SCSI port, and a volume control on the front of the case, plus a set of microphone and speaker jacks. In a bit of redundancy, the keyboard also hosts volume control and mute buttons. But the keyboard also offers convenient one-touch-launch buttons for telephony, Web, and user-selected applica-

tions as well as a sleep/lock screen saver function with password. The unit also came with the excellent HP Ergo 1600 21-inch monitor (\$1,570, included in price above).

The Kayak XW produced the top High-End Winstone and CPUmark₃₂ results and was second only to the Intergraph unit on High-End Graphics WinMark 98. On most other tests, the unit had above-average performance and did particularly well on our 3D Studio Max tests in scenes where it had to cull non-visible data. However, the unit showed some weakness on our Softimage OpenGL rendering tests, where it was 25 to 38 percent below average. The unit's texture-mapping capabilities are also not very strong, as shown by relatively poor results

on our AVS/Express 2-D Texture test. A control panel offers suggested application-specific display settings for Pro/E, Softimage, 3D Studio Max, and others. We tested with the typical configuration option.

This workstation is not one of this roundup's bargains, but it offers great 2-D performance. HP provides a three-year warranty, including one year of on-site service. Toll-call telephone technical support is available weekdays, during extended business hours.—PN

Hewlett-Packard Kayak XW PC Workstation. Street price: \$20,570. Hewlett-Packard Co., Palo Alto, CA; 800-322-4772; www.hp.com/go/kayak. Choose 523 at www.pcmag.com/infolink.

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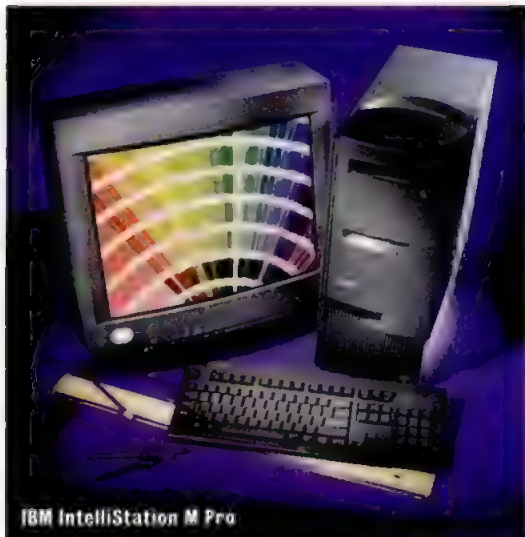
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IBM IntelliStation M Pro

With competitive performance and a long list of manageability and security features, the IBM IntelliStation M Pro (\$10,800 street) more than holds its own. The unit does best on 2-D tasks but also has solid 3-D OpenGL rendering capabilities.

IBM markets the dual-Pentium II/300 IntelliStation as a powerful graphics workstation that doubles as a highly man-



ageable corporate PC. The vendor also offers its Z Pro series of Pentium Pro workstations and (for those needing more power) a comprehensive RS/6000 series of PowerPC-based Unix workstations.

Our unit came in a tower case and was configured with a 24X CD-ROM drive and Intergraph's Intense 3D Pro 2200/4T PCI graphics board. The board comes with 16MB of SDRAM for frame memory and 4MB of texture memory and incorporates Intergraph's RealizM 3D graphics technology. In addition to OpenGL support, the Intergraph Intense 3D Pro 2200/4T also supports a fairly wide range of APIs such as the RenderGL, DirectDraw, Direct3D, and Heidi standards. The board can also take the optional Intergraph geometry accelerator, which includes seven DSPs, for greater graphics power.

IBM stresses the IntelliStation's DMI 2.0-compliant manageability and security features: Its integrated Intel Ethernet adapter supports wake-on-LAN; its chassis is protected with an intrusion alarm; and its two 4.5GB IBM Ultra Wide SCSI hard disks support SMART

error-notification functions. The major components, including memory and CPU, are laser-etched with unique identification codes to help with tracking in case of theft. Also included was IBM's LANClient Control Manager software and an IBM 20-inch monitor (\$1,680 street, included in the above price).

In addition to the integrated 10/100-Mbps Ethernet adapter, the motherboard includes an integrated 16-bit, Sound Blaster Pro-compatible audio subsystem, IDE and SCSI ports, an open AGP port, and an IR port connector. There are plenty of slots for expansion—the two ISA slots and three of four PCI slots. The case offered clear access to all internal components but had just two open drive bays.

Among the reviewed Windows NT 4.0-based machines, the IntelliStation proved its viability as a high-end, general-purpose PC with average scores on our Winstone 98 and WinBench 98 tests. The unit posted mostly average results on our applications tests as well, but it fell 30 percent behind the mean in the AVS/Express 3-D Texture rendering test, and 40 percent behind on the AVS/Express 2-D Texture test. These per-



formances are directly linked to its having only 4MB of memory dedicated to texture mapping. But the unit's Photoshop Gaussian Blur and Softimage OpenGL (1,024-by-768 resolution) test timings were 60 percent shorter than the mean. The unit should do well on image editing, 3-D modeling, and mechanical CAD tasks.

The unit is bundled with Lotus SmartSuite 97 as well as a number of IBM CD-ROMs, including a Client Systems Essentials CD, which includes technical documents and a collection of Lotus Freelance presentations. IBM offers a three-year-parts, one-year-labor warranty, with 24-hour, toll-free technical support.

—Robert S. Anthony

IBM IntelliStation M Pro. Street price: \$10,800. IBM PC Co., Research Triangle Park, NC; 800-426-2968; www.us.pc.ibm.com/intellistation. Choose 524 at www.pcmag.com/infolink.

Intergraph TDZ 2000 3D Graphics Workstation



The Intergraph TDZ 2000 3D Graphics Workstation (\$15,000 street) delivered performance nearly as flamboyant as its big purple case with the white Z badge on the bezel, and it earned our Editors' Choice. The unit's well-balanced system architecture with strong graphics and disk subsystems resulted in scores near the top in almost all categories. Of course, all that performance comes at a premium, the highest price tag in this roundup. But Intergraph's target market of digital content creators, animators, and visual simulation and advanced CAD/CAM users should be well satisfied. This is Intergraph's top-of-the-line workstation.

The TDZ 2000 comes with add-ons Intergraph shipped for the RealizM II VX25 OpenGL accelerator. These upgrades, which include 16MB of texture memory (\$300) and a geometry accelerator

The Intergraph unit earned top-range scores across our tests.

(\$1,530) to offload processing from the pair of Pentium II/300 CPUs, are responsible for the graphics performance of this system.



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	V115	Q100	V85	V775	V773	Q71	V665	Q53	Q51	Q41
Size/Viewable	21"/20.0"	20"/18.4"	19"/18.0"	17"/16.0"	17"/16.0"	17"/16.0"	15"/13.8"	15"/13.7"	15"/13.7"	14"/13.2"
Dot Pitch	0.26mm	0.28mm	0.26mm	0.26mm	0.26mm	0.26mm	0.28mm	0.28mm	0.28mm	0.28mm
Max. Resolution	1600 x 1280	1600 x 1280	1600 x 1280	1600 x 1280	1280 x 1024	1280 x 1024	1280 x 1024	1280 x 1024	1024 x 768	1024 x 768
Optimum Resolution	1280 x 1024	1280 x 1024	1280 x 1024	1280 x 1024	1024 x 768	1024 x 768	1024 x 768	1024 x 768	800 x 600	800 x 600
Refresh Rate	60Hz	60Hz	60Hz	75Hz	75Hz	75Hz	75Hz	75Hz	75Hz	75Hz

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The 21-inch Intergraph 21sd107 monitor is no slouch either. A \$1,660 option (price included above), the monitor supports the VX25's huge resolutions and high refresh rates and delivered exceedingly crisp graphics on our tests. Intergraph did not skimp on the disk subsystem, which includes a pair of 4GB Seagate Cheetah Ultra Wide SCSI drives configured in RAID 0. (A RAID configuration can significantly boost disk I/O performance for sustained data-transfer operations, such as video capture, but these operations are only occasionally performed.)

With fast graphics and disk subsystems, the Intergraph unit performed very well. It especially distinguished itself on our 3D

Studio Max tests, where it led the pack and showed no performance drop even when moving from 20,000- to 100,000-triangle scenes, its score hovering 46 to 67 percent above average. The unit also did very well on our Pro/Engineer test, where it rivaled the Digital system. Intergraph was outclassed only in floating-point-intensive tests (such as the AVS Volume Ray Tracing and Softimage Mental Ray) by the Digital and Sun workstations, whose processors have superior floating point units.

The massive Ultra-Tower chassis offers acres of expansion room. Beyond the pair of 5.25-inch bays that open to the front of the machine, the TDZ 2000 has an unused AGP slot, six PCI slots, and a shared

PCI/ISA slot. It carries its audio and a 10/100Base-T PCI Ethernet port down on the motherboard. The graphics accelerator and geometry accelerator take up three of the PCI slots. Fortunately, the TDZ 2000 packs a 500-watt power supply and a massive cooling system. There's room for memory expansion, too: The 128MB of ECC SDRAM memory comes on a single DIMM, leaving three DIMM slots open. The system also has two USB ports and an external Narrow SCSI port.

If you do run out of space, you can add the external TowerMate expansion base. This docking platform for the Ultra-Tower chassis can house adapter slots and a RAID array.

SUMMARY OF FEATURES

Graphics Workstations: System Features

Price of tested configuration For workstations sold through resellers, assume that street prices will be 10 to 15 percent lower than list prices. Some vendors factor this discount directly into their quoted prices, in which case we indicate that the cited price is a street price. All street prices are rounded to the nearest \$10. Some vendors sell directly to customers; in those cases, we list the prices as *direct*; such prices are not discounted.

Processor type Each of the reviewed Pentium-based systems had two processors; the non-Intel-based systems each had one CPU.

Installed system RAM Synchronous DRAM (SDRAM) offers a performance advantage over extended data out (EDO) DRAM, because the access to SDRAM is synchronized to the CPU's clock in order to minimize wasted clock cycles. Most systems in this roundup also use ECC (error-correcting code) memory, which tests for and corrects memory errors greater than 1 bit.

Hard disk interface The Ultra Wide SCSI protocol supports data-transfer rates of up to 40MB per second and the mixing of 8- and 16-bit devices, and is Plug and Play-compliant.

Maximum disk storage We list the maximum storage that each system can hold with no external devices.

CD-ROM drive speed We list the maximum speed of the CD-ROM drive.

Expansion-bus slots We list standard PCI slots that run on a 33-MHz bus as well as the next-generation PCI slots, noted as E-PCI, which run on a 66-MHz bus. We also report the number of Accelerated Graphics Port (AGP) slots, which also have a 66-MHz bus.

24-hour turnaround for replacement parts For any vendors that offer this service as an option, we list the duration and cost of the service.

For information on the **graphics subsystems** of these workstations, please see **Graphics Workstations: Graphics Features**.

■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

	Compaq Professional Workstation 6000	Digital Personal Workstation 500a	HP Kayak XW PC Workstation	IBM IntelliStation M Pro
Price of tested configuration	\$9,360 street	\$12,960 street	\$20,570 street	\$10,790 street
Processor type/speed (MHz)	Two Pentium II/300	Alpha 21164/500	Two Pentium II/300	Two Pentium II/300
Installed operating system	Windows NT 4.0	Windows NT 4.0	Windows NT 4.0	Windows NT 4.0
Bus interface	PCI	PCI	PCI	PCI
Installed/maximum system RAM	128MB ECC SDRAM / 512MB	128MB ECC SDRAM / 1.5GB	128MB ECC SDRAM / 512MB	128MB ECC SDRAM / 512MB
Hard disk	Seagate ST34371W, Western Digital Enterprise 4360	Quantum Atlas II	Seagate Cheetah ST34501W	IBM DCHS
Capacity and interface	Two 4GB Ultra Wide SCSI	Two 4GB Ultra Wide SCSI	Two 4.3GB Ultra Wide SCSI	Two 4.5GB Ultra Wide SCSI
Maximum disk storage	54GB	27GB	27GB	22.7GB
Disk drive controller	Compaq 32 (on motherboard)	Adaptec AHA 2940UW (PCI Card)	Adaptec Ultra Wide SCSI (on motherboard)	Adaptec AIC 7895C (on motherboard)
Monitor (claimed diagonal size, in inches)	Compaq 630 P110 (21)	Digital PCXAV-YZ (21)	HP Ergo 1600 (21)	IBM P201 (21)
CD-ROM drive	Sony CDU571	Toshiba XM-5702B	Panasonic CR 585-D	Sony
Speed and interface	16X IDE	12X SCSI	24X ATAPI	24X IDE
Network adapter	Netelligent 10/100 TX	10/100 ES9652F2C4 Ethernet	HP Enhanced 10/100Base-T Ethernet	Intel 82557 10/100Base-T Ethernet
Motherboard components				
Motherboard manufacturer	Compaq	Digital	HP	IBM
Chip set	Compaq with RCC chip set	Digital Alpha 21164	Intel 440LX	Intel 440LX
BIOS manufacturer and version (or date)	Compaq (8/20/97)	AlphaBIOS 5.34	Phoenix 4.0, Rel. 6	IBM (10/8/97)
Flash BIOS/Plug and Play functionality	■ ■	■ ■	■ ■	■ ■
Expansion-bus slots	1 PCI, 5 PCI/ISA	2 E-PCI, 3 PCI/ISA	1 AGP, 1 ISA, 3 PCI, 1 PCI/ISA	1 AGP, 2 ISA, 4 PCI, 1 PCI/ISA
Accessible drive bays (5.25", 3.5")	3/1	3/1	3/2	2/2
Internal drive bays (5.25", 3.5")	0/6	0/2	0/2	0/2
Parallel/serial/mouse ports	1/2/1	1/2/1	1/2/1	1/2/1
USB/SCSI ports	2/1	1/1	2/1	2/1
Service and Support				
24-hour, 7-day live technical support	■	■	■	■
Standard warranty on parts/labor	3 years/1 year	3 years/3 years	3 years/3 years	1 year/3 years
On-site service charge (first year)	Included	Included	Included	Included
24-hour turnaround for replacement parts	■	■	□ (3 years, \$150)	■
N/A—Not applicable. The product does not have this feature.				

The unit comes with a three-year warranty and 24-hour technical support. All told, the Intergraph system delivers.—*PN*
Intergraph TDZ 2000 3D Graphics Workstation.
 List price: \$20,880. Intergraph Computer Systems, Huntsville, AL; 800-763-0242, 205-730-5441; www.intergraph.com/ics. Choose 525 at www.pcmag.com/infolink.

Micron Powerdigm XSU

Despite its price, the Micron Powerdigm XSU (\$8,359 direct) is difficult to recommend because of its mixed scores on our benchmark and application tests and its limited expandability. The unit does excel, however, in handling 2-D and 3-D modeling with lots of complex texturing. Micron

markets this unit for the CAD/CAM, digital creation, and financial analysis markets. Although the single-processor version of this system earned an Editors' Choice in an earlier roundup ("The Two Faces of 300 MHz," September 23, 1997), the dual-processor model is eclipsed by its competitors. The dual-Pentium II/300 Powerdigm is at the top of this vendor's workstation series, which includes the Powerdigm XLI series of Pentium Pro-based units.

The Powerdigm has a great disk subsystem as well as very good texture-mapping performance but poor GDI graphics performance and poor rendering of geometry and simple, shaded polygons. Accordingly, it was above average on our High-End Disk

WinMark 98 test, but below average on our High-End Winstone 98 and High-End Graphics WinMark 98 tests. Its results on our graphics application tests were also mixed. The unit shone on our AVS/Express 3-D Texture rendering test, where it had the best score. It was also better than the mean on our AVS/Express 2-D Texture rendering test. And its Pro/Engineer Trail File timing was 20 percent shorter than the mean. The Powerdigm did fairly well on our 3D Studio Max tests, except where it had to cull nonvisible data. Its AutoCAD scores were worse than average, however, and it had the worst results on our Softimage OpenGL rendering tests.

The Powerdigm packs some hard-core components: Its motherboard utilizes Micron's innovative Samurai PCI chip set, which supports up to 1GB of SDRAM

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PC MAGAZINE
 EDITOR'S CHOICE

Intergraph TDZ
 2000 3D Graphics
 Workstation

Micron
 Powerdigm XSU

Netpower
 Symetra3

SGI O2 R10000

Sun Ultra 30

\$15,000 street	\$8,359 direct	\$8,890 street	\$15,500 street	\$17,500 street
Two Pentium II/300	Two Pentium II/300	Two Pentium II/300	MIPS R10000	UltraSparc II/300
Windows NT 4.0	Windows NT 4.0	Windows NT 4.0	Irix 6.3	Solaris 2.6
PCI	PCI	PCI	Unified Memory Architecture	Ultra Port Architecture
128MB ECC SDRAM / 512MB	128MB SDRAM / 1GB	128MB SDRAM / 512MB	195MB SDRAM / 1GB	192MB ECC SDRAM / 2GB
Seagate Cheetah ST34501W	Seagate Barracuda 7200K	Seagate ST19171W Seagate 32171W	IBM Scorpion	Seagate ST34371WC
Two 4.3GB Ultra Wide SCSI	9GB Ultra Wide SCSI	Two 4GB Ultra Wide SCSI	4GB Ultra SCSI	4.2GB Ultra Wide SCSI
36.4GB	27GB	27GB	9GB	8.4GB
Symbios 53C875 (on motherboard)	Adaptec AHA 2940UW (PCI Card)	Adaptec AIC 7895C (on motherboard)	Adaptec UltraFast SCSI (on motherboard)	Seagate Ultra SCSI ST3437 (on motherboard)
Hitachi 21sd107 (21)	Hitachi (19)	Iiyama VisionMaster (21)	Silicon Graphics 6DM-17E21 (21)	Sony GDM-20E (20)
Panasonic CR-585-B 24X EIDE	Plextor PX-20TSI 20X SCSI	Toshiba XM6102B 24X IDE	Proprietary 12X SCSI	Sun CD 12X SCSI
Intel EtherXpress PRO 10/100Base-T Ethernet	3Com Fast Etherlink XL 3C905 10/100	Intel 82557 10/100Base-T Ethernet	10/100-Mbps proprietary	10/100Base-T Autosense Ethernet

Intergraph Intel 440LX	Micron Samurai	Intel Intel 440LX	Silicon Graphics Proprietary	Sun Sun
Intergraph 926B	Phoenix 5.12	Phoenix 4.0, Rel. 6	Proprietary (Proprietary)	Sun
1 AGP, 6 PCI, 1 PCI/ISA	2 ISA, 1 E-PCI, 3 PCI, 1 PCI/ISA	1 AGP, 1 ISA, 3 PCI, 1 PCI/ISA	1 PCI	3 PCI, 1 E-PCI
3/1	2/3	3/2	1 (proprietary) / 0	1/2
0/3	3/0	0/1	1/0	0/4
1/2/1	1/2/1	1/2/1	1/2/1	1/2/1
2/3	2/1	2/1	0/2	0/1

3 years/3 years	5 years/3 years	3 years/3 years	1 year/1 year	1 year/1 year
N/A	Included	Included	\$840	\$528
		□ (1 year, \$385)	■ (1 year)	



and—more important—a second, independent, 64-bit, 66-MHz PCI bus. In addition to its speed advantage over a standard 32-bit, 33-MHz PCI bus, this second PCI bus permits graphics data to avoid data bottlenecks on the main bus. But the chip set seems to hinder the coordination of a dual-processor subsystem compared with an Intel chip set—negating some advantages.

The unit's 64-bit PCI slot was occupied by a Diamond Multimedia Fire GL 4000 66-MHz graphics board, which supports Heidi and Direct3D as well as OpenGL. The board came with 15MB of SDRAM for frame and Z-buffer functions and 4MB of CDRAM (upgradable to 16MB) for texture buffering. It also uses a 3DPro/2mp chip set developed by Mitsubishi Electronics America and Evans & Sutherland Computer Corp. According to our informal tests, this chip set is partly responsible for the unit's uneven performance.

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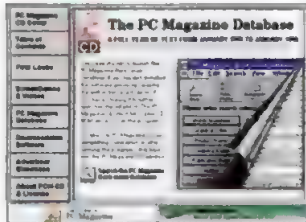
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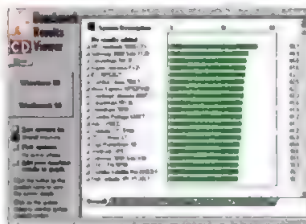
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SUMMARY OF FEATURES

Graphics Workstations: Graphics Features

2-D graphics accelerator chip Often separate integrated circuits are used for displaying 2-D and 3-D graphics, and such graphics cards have separate 2-D and 3-D accelerator chips. Others have the two chips combined into one.

On-the-fly resolution adjustment and refresh rate control and On-the-fly color depth adjustment On-the-fly adjustments take effect without rebooting or restarting the operating system's graphical interface.

Color calibration of RGB value Some graphics card utilities allow you to adjust the color value of the signal output from the graphics card to a setting optimized for the monitor.

Geometry processor chip For faster rendering, geometry processing can be off-loaded to a specialized integrated circuit.

Frame buffer memory The more frame buffer memory the graphics card has, the larger the screen resolution and the higher the color depth it supports. 16MB is required for displaying 1,600-by-1,280 at true color in double-buffer mode.

Texture memory The texture memory is used for rendering the texture locally on the graphics card, freeing the system I/O bus.

Z-buffer memory The Z-buffer memory stores the depth value of each 3-D object, which determines whether the object is visible or hidden behind another object.

Double-buffered color depths Some graphics systems divide the frame buffer memory in two and buffer two consecutive frames.

Bilinear filtering Bilinear filtering calculates the color value of a texel (texture element) applied to a pixel by taking the weighted average of four adjacent texture elements. This produces a smoother, more realistic image.

MIP mapping For optimal performance in realistic 3-D scene display, textures of various levels of detail can be applied to objects in a scene depending on each object's distance from the view point.

Trilinear MIP mapping Some systems perform linear filtering between texture maps of varying levels of detail, smoothing the edge transitions between the different-resolution textures. Also, within a particular texture map, linear filtering is used to apply texture data to an object's pixels. This method produces natural-looking 3-D surfaces.

Perspective texture correction at 8 and 16 bits To induce a more accurate sense of distance, the texture images are distorted in reference to the point of origin.

Anisotropic texture memory When an object is tilted in respect to the view plane, bilinear and trilinear texture filtering do not always yield the best results. Both methods assume that the texture elements applied to the image surface are round, but the projection of texels onto the pixels needs to be elliptical. Anisotropic texture filtering accounts for this odd positioning of objects and produces images of superior realism.

	Compaq Professional Workstation 6000	Digital Personal Workstation 500a	HP Kayak XW PC Workstation	IBM IntelliStation M Pro
Graphics card	ELSA GLoria XL	Intergraph 4D60T	Visualize fx4	Intergraph Intense 3D
2-D graphics accelerator chip	ELSA GLoria XL	Intergraph 4D60T	HP Visualize Raster Engine	Cirrus CL-GD5446-HC-A
Display Characteristics				
Maximum number of colors/refresh rate at:				
1,600 x 1,280	16.7 million/85 Hz	N/A	16.7 million/75 Hz	N/A
1,152 x 864	N/A	16.7 million/100 Hz	16.7 million/85 Hz	N/A
1,024 x 768	16.7 million/100 Hz	16.7 million/85 Hz	16.7 million/120 Hz	16.7 million/85 Hz
800 x 600	16.7 million/100 Hz	16.7 million/85 Hz	16.7 million/85 Hz	16.7 million/85 Hz
640 x 480	16.7 million/100 Hz	16.7 million/85 Hz	16.7 million/85 Hz	16.7 million/85 Hz
Software Features				
On-the-fly resolution adjustment and refresh rate control	■ (via Win NT 4.0)	■	■	■
On-the-fly color depth adjustment	■ (via Win NT 4.0)	■	■	■
Virtual-desktop features:				
Maximum size (pixels)	N/A	1,920 x 1,200	1,600 x 1,280	N/A
Pan and zoom	N/A	■	■	N/A
Auto-centering	N/A	■	■	N/A
Color calibration of RGB value	■	■	■	■
Easy access to graphics utilities	N/A	N/A	■	N/A
3-D Features				
3-D rendering chip	3Dlabs MX	Intergraph RealizM II 3D	HP Visualize Raster Engine	Intergraph Intense 3D Pro 2200/4T
Geometry processor chip	3Dlabs Delta Processor	Intergraph RealizM II 3D	HP Visualize Geometry Engine	None
Frame buffer memory (installed/maximum)	16MB VRAM / 16MB	32MB SGRAM / 32MB	18MB SGRAM / 18MB	16MB SDRAM / 16MB
Texture memory (installed/maximum)	24MB EDO DRAM / 40MB	16MB SGRAM / 16MB	16MB SDRAM / 16MB	4MB SGRAM / 4MB
Z-buffer memory (installed/maximum)	Combined with texture memory	Combined with frame buffer memory	Combined with frame buffer memory	Combined with texture memory
Z-buffer depths supported	24-bit	32-bit	24-bit	24-bit
Accelerated double-buffered color depths:				
1,600 x 1,280	24-bit	24-bit	12-bit	N/A
1,280 x 1,024	24-bit	24-bit	24-bit	24-bit
1,152 x 864	24-bit	24-bit	24-bit	N/A
1,024 x 768	24-bit	24-bit	24-bit	24-bit
800 x 600	24-bit	24-bit	24-bit	24-bit
640 x 480	24-bit	24-bit	24-bit	24-bit
Supports most recent version of OpenGL	■	■	■	■
Other APIs supported	Heidi	Heidi, OpenGL, RenderGL	Heidi	DirectDraw, Direct3D, Heidi, RenderGL
3-D Chip Set Features				
Bilinear filtering	■	■	■	■
Trilinear filtering	■	■	■	■
MIP mapping	■	■	■	■
Trilinear MIP mapping	■	■	■	■
Perspective texture correction at 8 and 16 bits	■	■	■	■
Anisotropic texture memory	■	■	■	■
Video texture mapping	■	■	■	■

N/A—Not applicable: The product does not have this feature. *Aided by Sun's VIS technology.

See www.pcmag.com for interactive views

PC MAGAZINE
EDITOR'S CHOICE

Intergraph TDZ
2000 3D Graphics
Workstation

Micron
Powerdigm XSU

NeTpower
Symetra3

SGI O2 R10000

Sun Ultra 30

Intergraph Realizm
IIVX25 OpenGL

Diamond FireGL
4000

NeTpower Ultrafx2
3DLabs Delta+2 MX

Proprietary

Proprietary

16.7 million/75 Hz
N/A

N/A
16.7 million/85 Hz

16.7 million/75 Hz
N/A

N/A
16.7 million/
100 Hz

16.7 million/76 Hz
N/A

16.7 million/85 Hz

16.7 million/120 Hz

16.7 million/
100 Hz

16.7 million/75 Hz

16.7 million/76 Hz

16.7 million/85 Hz

16.7 million/120 Hz

16.7 million/
100 Hz

16.7 million/75 Hz

N/A

16.7 million/85 Hz

16.7 million/120 Hz

16.7 million/
100 Hz

16.7 million/75 Hz

16.7 million/80 Hz

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1,824 x 1,368

1,280 x 1,024

1,920 x 1,080

N/A

122,880 x 76,800

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Intergraph Realizm
II 3D

Mitsubishi 3D
Pro/2MP

3DLabs MX

Silicon Graphics

Creator Graphics

Intergraph Realizm
II 3D

Evans & Sutherland
RealImage 1000

3DLabs Delta
Processor

MRE

Creator 3D Graphics

32MB SDRAM /
32MB

15MB 3D-RAM /
15MB

16MB VRAM /
16MB

Limited to main
memory size

15MB / 15MB SRAM

16MB SGRAM /
64MB

16MB CDRAM /
16MB

32MB DRAM /
32MB

Limited to main
memory size

Limited to main
memory size

Combined with
frame buffer
memory

Combined with
frame buffer
memory

12MB DRAM /
12MB

Limited to main
memory size

5MB / 5MB DRAM

32-bit

24-bit

32-bit

24-bit

28-bit

24-bit

N/A

32-bit

N/A

N/A

24-bit

24-bit

32-bit

24-bit

24-bit

24-bit

24-bit

32-bit

24-bit

24-bit

24-bit

24-bit

32-bit

24-bit

N/A

24-bit

24-bit

32-bit

24-bit

24-bit

Heidi, OpenGL,
RenderGL

Direct3D, Heidi

Heidi

Inventor, Performer

XGL

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Wide SCSI hard disk and a 20X SCSI CD-ROM drive, the Powerdigm's midtower case housed an internal Iomega Jaz drive. The unit also came with an Adaptec AHA2940U Ultra Wide SCSI PCI adapter, a Creative Labs AWE wavetable sound board, and a 10/100-Mbps PCI Ethernet card. This configuration left just one PCI and one ISA slot open. Access to the unit's three open drive bays is partially blocked by knots of cabling. It also came with a 19-inch Hitachi monitor (\$600 direct, included in the above price).

Powerdigm units are not bundled with application software, but Micron includes a three-year parts-and-labor warranty (the CPU and RAM are covered for five years) and a year of on-site service.—RSA

Micron Powerdigm XSU. Direct price: \$8,359. Micron Electronics Inc., Nampa, ID; 888-634-8799, 208-893-3343; fax, 208-893-3424; www.micronpc.com. Choose 526 at www.pcmag.com/infolink.

NeTpower Symetra3

NeTpower's design efforts are focused solely on leading-edge Windows NT machines, but its flagship graphics workstation offers neither the performance nor the expandability of many competing x86 systems. But the Symetra3 (\$8,890 street), a dual-Pentium II/300 model, is one of this roundup's most inexpensive workstations, coming in at less than half the cost of the premier x86 systems—Intergraph's TDZ 2000 and Hewlett-Packard's Kayak XW. NeTpower targets the unit and its Pentium Pro-based siblings at design engineers and creative professionals unwilling to spend additional dollars on Unix machines.

The unit was, for the most part, a mediocre performer relative to the x86 competition. Its High-End Winstone 98



score was average, but its High-End Disk WinMark and Graphics WinMark 98 scores were 12 and 11 percent below average, respectively.

During applications testing, the unit typically scored from 5 to 10 percent worse than average. The Symetra3 took roughly 30 percent longer than average on the Pho-

can automatically optimize your display settings for a particular CAD or engineering application. On our tests, we observed slight performance improvements when using such optimizations. The Symetra3 is backed by round-the-clock, toll-free support and a three-year warranty with a year of on-site service.—CM



During application testing, the Symetra3 scored from 5 to 10 percent worse than average.

toShop RGB-to-CMYK test, a reflection of its deficient disk subsystem and (most likely) a lack of available memory. Poor AVS/Express and 3D Studio Max scores were largely attributable to the system's OpenGL card, NeTpower's own Ultrafx2, which is based on 3Dlabs technology. The unit did perform well on the Softimage OpenGL rendering test at up to 640-by-480 resolution, indicating that it should be well suited for mechanical CAD, visual engineering, or less complex animation tasks.

The unit's metal chassis cannot be opened without a screwdriver. Inside, what little room is available for expansion is difficult to access. Three 66-MHz DIMM slots are unoccupied, permitting up to 512MB of ECC SDRAM, but these are obstructed by a mass of cables.

Bus slot options are also limited. Though the Symetra3's motherboard integrates Intel 10/100-Ethernet and Crystal Logic audio, only a pair of PCI slots are unused and unobstructed. An off-board Ultra Wide SCSI port, which connects to an integrated Adaptec adapter, takes up the system's sole ISA slot and partially obstructs its only shared slot; the Ultrafx2 graphics card plugs into one of three PCI slots. The machine does afford an open AGP slot. There are two free bays, however; the other four are occupied by a pair of 4.1GB Seagate Ultra Wide SCSI hard disks, a 24X Toshiba CD-ROM drive, and a floppy disk drive. Our unit included a 21-inch Iiyama monitor (\$1,830 street, included in the above price).

The Ultrafx2, Revision 3.0, is built around 3Dlabs Glint and Delta chip sets; the NeTpower-manufactured card has Heidi and Nitro OpenGL drivers. Driver optimizations and other display changes are handled by a proprietary utility known as SmartInstall. Using this GUI tool, you

NeTpower Symetra3. Street price: \$8,890. NeTpower Inc., Sunnyvale, CA; 800-801-0900, 408-522-5199; fax, 408-720-8558; www.netpower.com. Choose 527 at www.pcmag.com/infolink.

SGI 02 R10000

There's no doubt that Silicon Graphics builds some of the best Unix servers on the market, but our tests show that when it comes to mainstream workstations, the SGI 02 R10000 (\$15,500 street) lags behind other Intel and non-Intel systems in its class. The primary strength of this product, as with the Sun Ultra 30, is the scalability of its platform. Applications that run on the R10000 can also run on SGI's monster servers, bigger than anything yet found in the Wintel-compatible world.

The unit depends on a MIPS R10000 processor, which delivers good overall performance for traditional application processing. It fell short on our graphics tests. The R10000 is Unix-based, running the operating system SGI Irix 6.3 and using a Motif-driven GUI. Because this is

a non-Wintel platform, you won't find many native mainstream business applications for it. The R10000 can run traditional Windows-based applications through SoftWindows, an emulator program, but the overhead of the processor emulation saps a lot of performance. The interface is intuitive for those users who come from the drag-and-drop world of Windows.

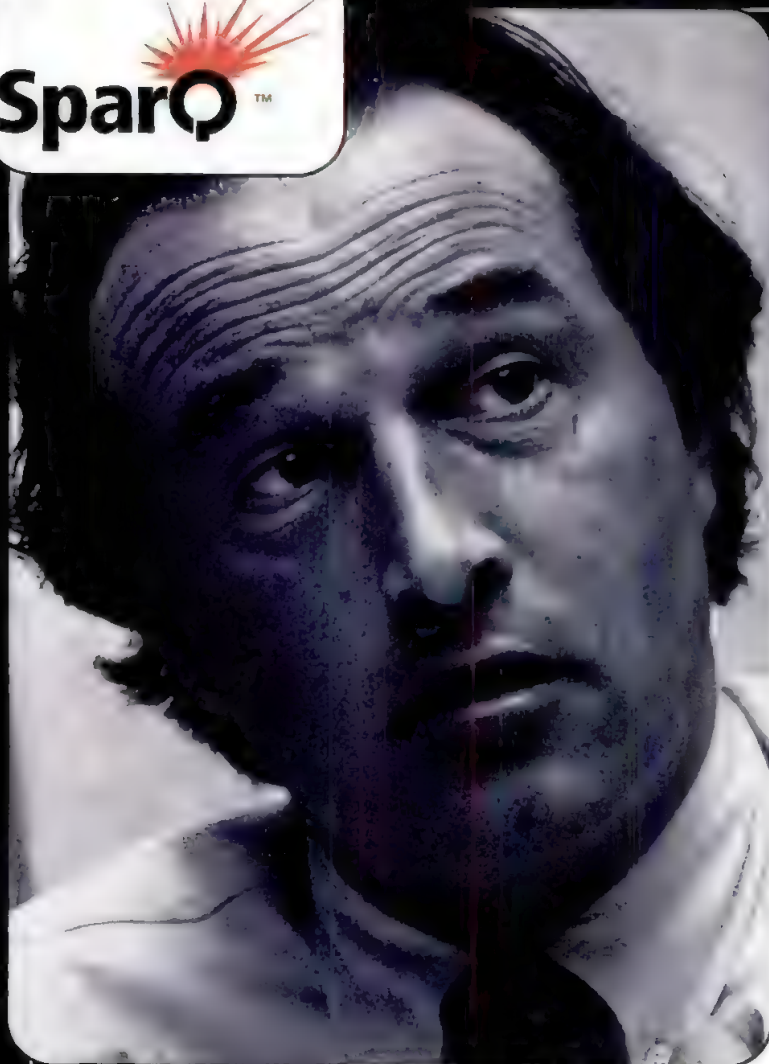
Another non-Wintel aspect of the R10000 is its use of the highly proprietary Unified Memory Architecture (UMA), which centralizes most memory services including video, compression, graphics, image processing, and I/O by using a high-bandwidth, low-latency memory subsystem. Unlike traditional PCs, in which the data is transferred among graphics, video, and imaging memory that exist on separate boards, all R10000 data resides in main memory. Thus, system, image, and video memory are all the same. This presents a potential benefit when you're dealing with large image files or high resolutions, because you are not limited to the memory that's on the graphics card.

Though UMA seems architecturally elegant, our tests prove that the Intel systems using high-end graphics coprocessors with their own on-board memory fared much better. The R10000 was in last place on all our Photoshop tests, except the RGB-to-CMYK test with a 30MB file. It also fared poorly on AVS/Express, Pro/Engineer, and Softimage tests, although its relative performance improved as the resolutions increased on the OpenGL portion. Dynamic memory allocation contributed

to its improved performance.

The system's administration tools are easy to use, and setup and configuration are simple. We also found the R10000 hardware easy to work with. Based on a five-piece modular design, devices such as disk drives, system modules, and PCI cards pop in and out from the rear of the unit. The hardware is proprietary, however, so don't count on snapping in disk drives and other Wintel peripheral devices. Our test system came with 195MB of RAM (expandable to 1GB of SDRAM), a 4GB disk, and a proprietary 17-inch monitor. For get-





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Developed by **Binary Research Ltd.**

ting data out of the box, you have a 10/100Base-TX Ethernet network port built in, as well as a dual Ultra Fast/Wide SCSI implementation and a 64-bit PCI expansion bus. The small case does not permit further expansion, with no free drive bays or expansion slots.

Poor scores aside, the issue is where the R10000 fits in. Though some businesses may require one or more of the relatively few high-end graphics applications that run only on the unit, most will find that one of the Intel-based workstations we tested provides a better fit and a better bang for the buck. But the R10000 does provide a platform with some place to go. Most of the Intel-based workstations we tested represent the top of the line available from vendors.

The unit comes with a one-year advance exchange warranty on parts and labor. This means that SGI will replace a part within 24 hours, before receiving the broken part from the customer. Along with the advance exchange policy, SGI offers round-the-clock, toll-free telephone technical support for one year.—David S. Linthicum

SGI O2 R10000. Street price: \$15,500. Silicon Graphics Inc., Mountain View, CA; 800-800-7441, 415-960-1980; fax, 415-961-0595; www.sgi.com. Choose 528 at www.pcmag.com/infolink.

Sun Ultra 30

The Sun Ultra 30 (\$17,500 street), from Sun Microsystems, is based on the Sun UltraSparc-II/300 CPU and takes the award for being the faster of the two non-Windows NT systems we tested. But it couldn't outperform this roundup's top Windows NT workstations.

Sun positions this product for the graphics, imaging, and design-automation markets. Our tests showed the Ultra to be most capable at mechanical CAD and engineering applications, which are not texture-heavy. As with the SGI unit, platform scalability is this system's strongest selling point. Application support is also a factor: There are many specialized graphics applications available for the Sun platform but few mainstream business applications.

The Ultra runs Solaris 2.6, an SVR4-

compliant, 64-bit Unix OS. This makes the Ultra binary-compatible with Sun systems with six times its power. Setup is simple, and the Solaris management features and application installation facilities are easy to use. There is an Intel version of Solaris,



but applications for that platform aren't binary-compatible with the UltraSparc version. If you must run Wintel applications, you can use SoftWindows or WABI (Windows Application Binary Interface), but be prepared for the performance level of a 75- or 100-MHz Pentium or a 486, respectively.

The UltraSparc-II/300 also powers



As with the SGI unit, scalability is the Sun system's strongest selling point.

Sun's proprietary Creator graphics technology. The Ultra Creator3D graphics system supports a high-speed, packet-switched memory interconnect. This subsystem supports texture-graphics mapping in main memory. Sun also implements an MMX-like instruction extension called the Visual Instruction Set (VIS), providing key mathematical and multimedia instructions useful for graphical operations, video compression and decompression, and communications, among other functions. The subsystem implements 24-bit graphics with double buffering, an 8-bit overlay plane, a 28-bit Z-buffer, and 4-bit stencil support. The Ultra Creator3D provides key benefits: Extremely large textures can exist in system memory, and the system supports video textures mapped onto objects.

Creator's 3DRAM integrates DRAM

and SRAM cache on a single chip with an on-chip arithmetic logic unit (ALU). The ALU is implemented directly on the 3DRAM chip. Thus, Z-buffering (required for 3-D hidden-surface removal) and the read/modify/write cycle are performed inside the 3DRAM. In the end, you get a 10-Mbps port that handles 3-D graphics better than conventional VRAM.

Our performance results were mixed. Although the Ultra ran our test applications faster than the SGI O2, it mostly lagged behind the Intel-powered and Digital Alpha-based systems. On our AVS Volume Ray Tracing test, which stresses floating-point ability, the Sun unit took 37 percent less time than the average. It also did well on our Photoshop RGB-to-CMYK conversion test, thanks to a good cache and memory subsystem. The unit did not do well on the Gaussian Blur test, which stresses integer-intensive operations, because it includes only a single processor. The dual processor Intel-based systems were able to benefit from a multithreaded implementation of this particular graphics filter. The unit also did poorly on our AVS Texture tests.

The Ultra comes in a mini-tower case with a 20-inch proprietary monitor. It also includes a high-performance Ultra SCSI subsystem using an enhanced, 66-MHz

PCI bus. There is a standard, integrated 10-BaseT and 100-BaseT interface, and four open PCI slots (three 33-MHz and one 66-MHz). Basic multimedia needs are met by a 16-bit audio subsystem, an internal speaker, and an external microphone.

The Ultra offers reasonable performance and an excellent growth path. Also, Sun has announced two new competitively priced workstations: the Ultra 5, based on the UltraSparc II/270, and the Ultra 10, based on the UltraSparc II/300. Basic configurations will start at under \$5,000 and \$10,000, respectively, with 64MB of RAM and 4GB hard disks.—DSL

Sun Ultra 30. Street price: \$17,500. Sun Microsystems Inc., Mountain View, CA; 800-786-3463, 415-960-1300; fax, 415-969-9131; www.sun.com. Choose 529 at www.pcmag.com/infolink. **PC**

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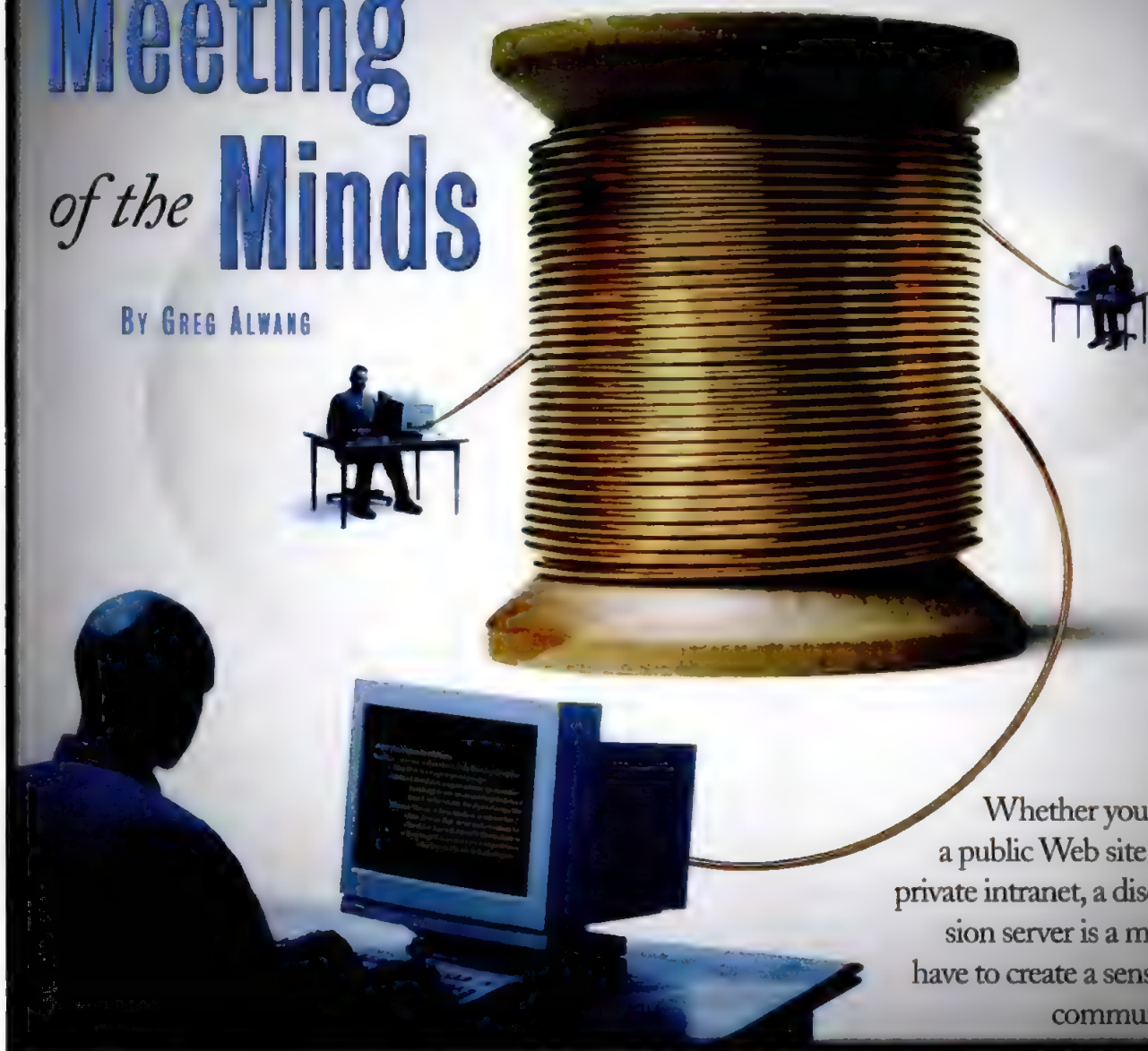
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WEB-BASED DISCUSSION SOFTWARE

Meeting of the Minds

By GREG ALWANG



Whether you run a public Web site or a private intranet, a discussion server is a must-have to create a sense of community.

Usenet newsgroups, or special-interest groups, have been using text-based discussions to build online communities for years. But not until the corporate community got into the act did Web-based discussion packages begin to gain momentum.

Companies such as Goldmine Software and Hewlett-Packard Co. use online forums as a cost-effective means of delivering technical and customer support: Users log on to the discussion and type in

a question, and a support person responds in writing. And media giants *The Wall Street Journal* and Columbia Tri-Star host forums on financial market and entertainment topics, respectively, as a means to add value to their primary offerings, promote loyalty, and build brand recognition.

In this growing market, we uncovered dozens of discussion packages. For this article, we review the ten leading products. (For information on additional packages, see the sidebar "Other Discussion Pack-

ages.") Seven of these products run on Microsoft Windows NT servers, three on Unix platforms only. One Unix offering, Well Engaged Discussions, hosts most of its customers' forums, so for our tests we allowed Well Engaged Discussions to host our forum site on its servers. Five pack-

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Test these products at the ZD Virtual Labs (www.virtual-labs.com).

PC MAGAZINE
 EDITORS' CHOICE

180 PC MAGAZINE FEBRUARY 24, 1998

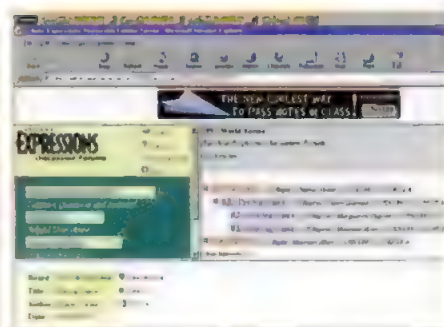
eShare Technologies

Expressions Interaction Suite



In a field marked by wide-ranging feature sets, implementations, and prices, Expressions Interaction Suite 3.0 (starting at \$795 list) offers the fullest set of capabilities at the best price, earning our Editors' Choice. The threaded product has a strong focus on ease of use, from the wizard-based installation to an intuitive and easy-to-customize user interface. The product's slew of innovative features includes the ability to link to other eShare servers, real-time chat rooms, user-name filtering, Web tours, and read-only forums.

Setup was painless. eShare's Midway Server connection lets you connect to other eShare servers worldwide, allowing you to access other chat rooms, search for



Expressions Interaction Suite lets you control screen colors without HTML.

users, and contact fellow users via a messaging utility.

Expressions packs a full complement of additional features, including a dial-up BBS discussion board, chat rooms, and a database generator that lets you edit discussion fields without writing HTML. Web Tours, another unique feature, lets you conduct interactive Web site tours or show a slide presentation. There's also the

Well Engaged Discussions 1.5	Wildcat! Interactive Net Server	Xpound! HT 2.21
Good	Fair	Good
Good	Good	Poor
Fair	Fair	Fair
Poor	Poor	Good
Fair	Fair	Fair
Good	Fair	Fair
Good	Good	Good
Good	Fair	Poor
Good	Poor	Fair
Good	Good	Good

are also assets. We prefer a threaded architecture, which lets users respond to individual messages, to a linear architecture

Under message creation, we track how rich and informative messages can be. They should support attachments, embedded graphics, and Web links

ments or display e-mail addresses and URLs as links. And Well Engaged Discussions includes a unique feature that lets you collapse the body of a long message into a link. More than half the products offer e-mail notification when a user responds to your posting—a nice time-saver if you can't check the forum frequently. Several products also include real-time chat rooms.

DISCUSSION ALTERNATIVES

Businesses have long used groupware discussions internally for brainstorming and collaboration, project tracking, and information distribution. All the major groupware packages now feature Web access, ostensibly transforming them into Web-based discussion servers. (See the sidebar "Prying Open Groupware.") These products also allow you to replicate discussions to read off-line, a feature you'll find only in the otherwise disappointing Wildcat! Interactive Net Server. But significantly, groupware threaded discussion lacks moderation and profanity filtering.

For those considering using a groupware package for internal threaded discussion combined with a Web-based discussion server for public discussions, there is another option: Teamware products such as HotOffice Virtual Office Service provide such collaboration features. (For more information, see "Instant Groupware" in our February 10 issue.)

Editors' Choice

Expressions Interaction Suite 3.0



Web administrators need to be of two minds when shopping for a discussion server. Of course they want a product that's easy to set up and administer, with a

broad array of management tools. But they also need to consider a package that's customizable, with features and functionality that will make users want to come back time and time again.

Only one product will satisfy administrators and users alike: eShare Technologies' Expressions Interaction Suite 3.0. Expressions has a wizards-based setup and rich message management. Its moderation control includes the ability to designate forums as read-only, plus message previewing and user-name filtering. The product's ability to add rotating banners and ads and to conduct Web tours of other sites is unique.

Site customizability is where Expressions, the only product to include easy-to-use WYSIWYG editing tools, really shines. Administrators will love the Color Picker for quickly changing back-

ground colors, and the Database Generator, which makes editing, adding, and removing discussion fields easy—without HTML editing.

Users will appreciate Expressions' ability to connect to other eShare servers globally; its real-time chat rooms, intuitive interface, message threading, and text search; and its ability to embed messages with attachments and links.

Another product deserves honorable mention: O'Reilly & Associates' WebBoard 2.0. Though it lacks Expressions' slick user interface and filtering capability, and it requires an HTML maven to customize, the product is inexpensive and easy to set up. Management tools are extensive, headlined by peerless archiving capability. Users benefit from a full complement of messaging features that include a spell-checker, e-mail notification, and clever keyboard search capabilities.

Discussion Models

TOPIC: New Uniforms for 1998 Season

Sue: Need to select new uniform colors by Friday. I need help! (3 responses)

Mike: How about teal pinstripes and gray caps?

Debbie: I like teal shirts, gray pants, and white caps. (2 responses)

Erin (Acctg): To save costs, let's just change the shirts or the pants. (1 response)

Jason: I love Debbie's idea. And why not white caps? We're the good guys!

Shannon: Why can't we let the fans choose the uniform colors? (3 responses)

Arnie: Awesome! I'll get air time about new uniforms, but how do we get fan input?

Sue: I'll have Mary in IS post a public discussion forum on our Web site and we'll take votes

Erin (Acctg): We can make it a contest and give the winner season tickets. (1 response)

Sue: Great idea! I'm sure the Board will approve

Threads can collapse so you can skip postings that don't need to see.

[Thread 1]

[Thread 2]

[Thread 3]

[Thread 4]

[Thread 5]

Responses to previous posts either start a new thread or are added to the original thread's reply stream.

Discussions can take place over a period of hours or days without losing the flow or content of the discussion.

THREADED The threaded discussion model provides a much more sophisticated level of message organization than the linear model. You can respond to a specific message only, which allows the discussion to branch off into subdiscussions. A new user can quickly capture the dynamic of the discussions by viewing each thread header. Any thread can be collapsed or expanded, making it easy to drill down to the desired content. In addition, sort and search capabilities make it easy to find a specific message by header, author, or date.

The original chronology of the messages is always maintained, allowing no way to organize responses by author, subject, or time.

There's no way for one team member to respond to another directly.

LINEAR The linear discussion model is easy to use but has limited capabilities. Postings are listed in chronological order, with each new message appearing at the end. When you join a linear discussion for the first time, you need to scroll through most of the postings to get a feel for the discussion. There is no way to respond to a particular message. Sorting and searching features facilitate finding a posting that interests you, but generally you'll find yourself wading through tons of information.

TOPIC: New Uniforms for 1998 Season

Sue: Need to select new uniform colors by Friday. I need help! (11 responses)

Mike: How about teal pinstripes and gray caps?

Debbie: I like teal shirts, gray pants, and white caps

Erin (Acctg): To save costs, let's just change the shirts or the pants

Jason: I love Debbie's idea. And why not white caps? We're the good guys

Shannon: Why can't we let the fans choose the uniform colors?

Sue: Erin, cost is not an issue—the boosters raised enough to replace everything

Arnie: Awesome! I'll get air time about new uniforms, but how do we get fan input?

Erin (Acctg): Fine, Sue. Do what it takes, then

Sue: I'll have Mary in IS post a public discussion forum on our Web site and we'll take votes

Erin (Acctg): We can make it a contest and give the winner season tickets

Sue: Great idea! I'm sure the Board will approve

ability to add rotating ads and banners globally or to individual discussion boards.

Expressions' administration capability is powerful and easy to use. You can limit the length of a message and the number of replies and specify a discussion board's attributes, such as read-only or moderated. You can preview messages before posting and control which users can add attachments or HTML tags. And read-only forums serve as an effective way to make global announcements. For profanity filtering, the product has a user-definable dictionary.

Expressions' customization features are outstanding, providing the power to make extensive changes without editing HTML. The Color Picker lets you change an object's color simply by selecting the object and choosing from a palette. The Database Generator lets you add, edit, and remove discussion fields using simple forms.

The user interface is extremely well laid out and intuitive to use. The message board area is divided into three easy-to-navigate panels. You can view or create messages easily using navigation and reply buttons, and embedding attachments and

links is also easy. Expressions features rich full-text search capabilities but no message sorting.—*Dawn A. Learned*
Expressions Interaction Suite 3.0. List price: 50 users, \$795; 150 users, \$1,695; 250 users, \$2,295; 550 users, \$3,495; 1,050 users, \$5,995. Requires: Microsoft Windows NT, Solaris, or BDSI server; Internet Explorer 3.x or Netscape Navigator. eShare Technologies, Commack, NY; 888-374-2734, 516-864-4700; www.eshare.com. Choose 501 at www.pcmag.com/infolink.

SoftArc Inc.

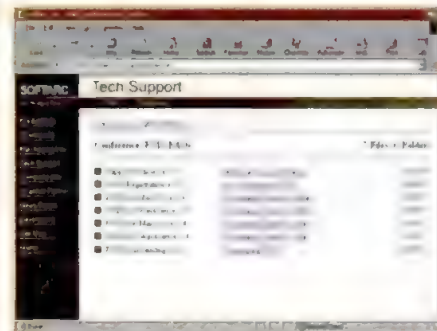
FirstClass Intranet Server

Unlike most products targeted primarily at commercial Web sites, FirstClass Intranet Server 5.1 (\$999 list) is a client/server package that also provides an optional Web-based interface. While we found the messaging capabilities of the browser version extremely limited, the client/server package marks a satisfactory choice for hosting corporate threaded discussions.

The lack of a single, unified setup wizard made installing the various components confusing. The administration tools are convoluted to use, though they are

granular. Numerous menus of configuration options warrant better organization, and an automated message expiration feature can only delete outdated messages, not archive them. Administrative controls are average. You can permit users to register for forums automatically, and you can configure a forum as public, private, or moderated. There is no filtering.

Creating forums is simple. To publish a discussion on the Web, simply drag and drop the forum icon onto the Internet folder. Customization requires editing the HTML templates. Using the client/server version's Intranet Client gives you the power of FirstClass Design-



The default user interface allows Web users read-only access to forums.



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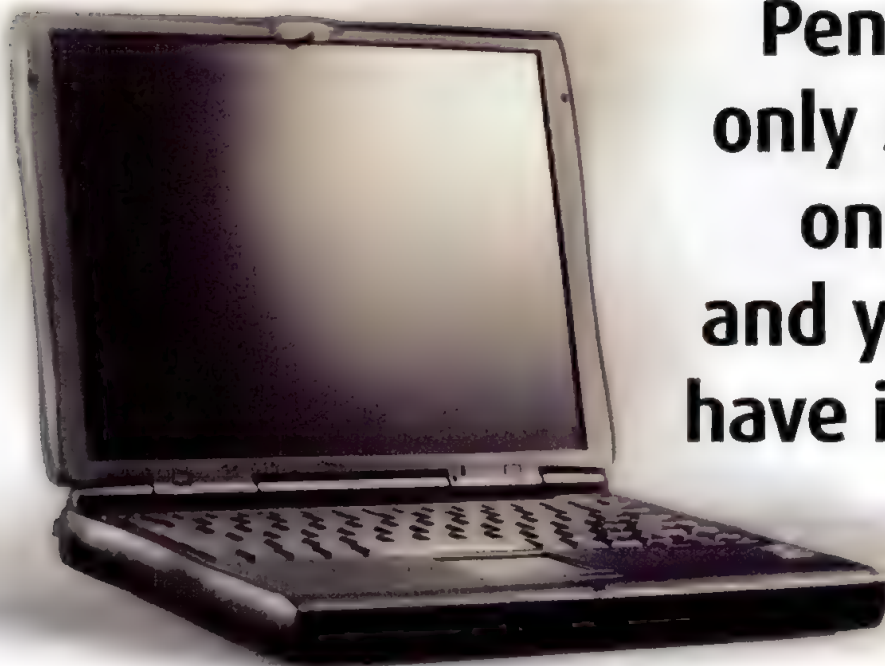
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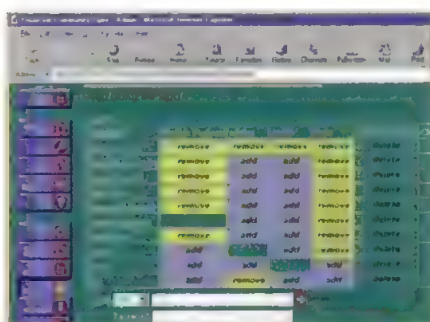
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procedure; no moderation, filtering, or archiving features; and a high price.

Many of the setup headaches we suffered could have been avoided if the program had granted us access to the online manuals and installation guide during setup. It let us read them only after the fact. Configuring the server and the included SQL database was complicated, a process punctuated by the program's refusal to accept our administrator ID. We had to call Proxicom technical support to get up and running.

We found the administrative features easy to use, though lacking in filtering, archiving, and moderation capabilities. J/Forum uses Access Control Lists (ACLs), an administrative method that can serve to moderate forums, in a sense: Administrators place registered users on an ACL and assign them forum privileges such as reading, posting, and deleting. The administrator then applies that ACL to one or more forums. Setting up a forum is a snap; simply click Create Forum, enter a forum name and description, and then select an ACL to associate with the forum.

Though customization options for



Proximcom J/Forum lets you add a user to a group with the press of a button.

J/Forum's proprietary Proxicom Template Markup Language (PTML) templates are plentiful, taking full advantage of them requires a solid knowledge of HTML, Java, and CGI scripts. PTML is a J/Forum extension to HTML that lets you control some Java elements without writing code.

The J/Forum user interface is full-featured and easy to navigate. There's no support for file attachments, but useful features include HTML message formatting, message previewing, and the ability to display e-mail addresses and URLs as links. J/Forum's search capabilities are boosted through unique SQL capabilities.

Searches may be performed on message bodies, subject, or authors, across or within forums by component, forum type, or type of message. You can also create custom search queries.—*DAL*

Proxicom J/Forum 1.0. List price: 10 forums, \$7,500; additional 10 forums, \$4,500. Requires: Pentium-based PC with Microsoft Windows NT 3.51 or 4.0, or Unix server with Solaris; 64MB RAM (256MB recommended), 200MB hard disk space, Internet Explorer 3.x or Netscape Navigator. Proxicom, Reston, VA; 888-932-4323, 703-262-3200; www.proxicom.com. Choose 505 at www.pcmag.com/infolink.

O'Reilly & Associates Inc.

WebBoard

WebBoard 2.0 (starting at \$59.95 list) provides a good, quick-start discussion package priced so reasonably that you'll wonder why others cost so much. Even though WebBoard lacks a slick user interface and requires an experienced Web author to customize it, the product is very easy to administer and includes some useful features other packages lack, such as archiving, real-time chat, and a spell-checker.

NNTP and Listservs Go Corporate

An interesting alternative to Web-based discussion packages has appeared on the scene: NNTP-based discussion products for Windows NT. While Unix-based NNTP (Network News Transfer Protocol) servers have traditionally been the domain of public discussion forums, or Usenets, two NNTP server packages—**NetWin's Dnews 4.5** (\$95 to \$485 list) and **MetalInfo's NewsChannel Pro for Windows NT 1.0** (\$295 list)—leverage the power of the NNTP protocol for the corporate intranet. These products offer your workgroup access to more than 20,000 Usenet discussion groups and the ability to create private forums.

NNTP's administrative and end-user capabilities are robust. You can restrict server access to individuals based on a specified domain or IP address and retrieve only the newsgroups or hierarchies you wish. Dnews lets you configure basic spam filtering to control content further. Users can download unread messages and post responses later; most browsers include one. (NetWin Ltd., Mt. Roskill, Auckland, New Zealand; 64-9-630-0689; www.dnews.org)

netwin site.com. Choose 519 at www.pcmag.com/infolink. MetalInfo, Seattle; 206-674-3700. www.metainfo.com. Choose 518 at www.pcmag.com/infolink.)

Another powerful approach to information distribution is e-mail: Electronic mailing lists (or Listservs) let you push your NNTP discussion

directly to users. Long a staple of Unix servers, mailing-list products have become available in the recent past in Windows NT versions from both L-Soft International and Mustang Software.

Perhaps the best-known product in the category of pushing messages is L-Soft's **Listserv Classic** (\$625 to \$7,876 list). A scaled-down version of this

How NNTP Servers Work

The Dnews client sends a message to an NNTP server. The NNTP server replicates the message to the other servers on the backbone, and the message is distributed to clients as needed.



model is also available. (L-Soft International, Landover, MD, 800-399-5449; www.lsoft.com. Choose 516 at www.pcmag.com/info/link.)

Mustang Software's List-Caster (\$299 list) offers a Windows NT- or Windows 95-based solution that includes a powerful SMTP/POP3 server and quick integration with your existing Web server. (Mustang Software Inc., Bakersfield, CA; 800-999-9619, www.mustang.com. Choose 517 at www.pcmag.com/infolink.) —HHH

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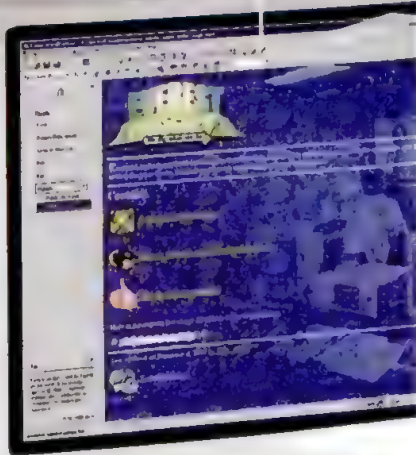
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BYTE Magazine, July 1997



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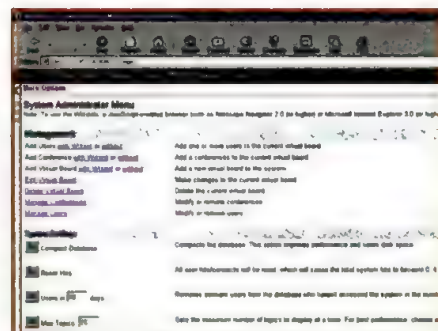
Web-Based Discussion Software

PC MAGAZINE
EDITORS' CHOICE

	Expressions Interaction Suite 3.0	FirstClass Intranet Server 5.1	Message Boards 1.01	Motet Conferencing Software 1.26	Proximcom J/Forum 1.0	WebBoard 2.0	Web Crossing 2.0.2
■ YES ■ NO							
List price	50 users, \$995; 1,050 users, \$5,995	\$999	50 users, \$2,995	50 users, \$1,750; unlimited users, \$5,000	10 forums, \$7,500; each additional 10 forums, \$4,500	2 Virtual Boards, 10 conferences each, \$59.95	100 users, \$495; unlimited users, \$995
Platforms supported	Windows NT, Solaris 2.5, BSDI	Windows NT	Windows NT 4.0, most Unix	All Unix	Windows NT 3.51, Solaris 2.5.1	Windows 95, NT	Windows 95, NT, most Unix
Wizard-based/custom installation	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Built-in database software	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Web Site Setup and Administration							
Authoring tool provides wizards for page setup	■	■	■	■	■	■	■
Authoring tool uses WYSIWYG interface	■	■	■	■	■	■	■
Integrable with user lists preset in Web server software	■	■	■	■	■	■	■
Administration							
Administrator can set user-level access:							
Read-only	■	■	■	■	■	■	■
Read/Post/Delete	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Create/delete forms	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Profanity filtering:							
Deletes/replaces offensive words	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Rejects postings with offensive words	■	■	■	■	■	■	■
Administrator can delete/archive messages	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Navigation and Use							
User can customize and save pages	■	■	■	■	■	■	■
User can sort messages by date/author/thread	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
User can view messages by date/unread only	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User can perform full-text/fielded/Boolean searches	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Previous and next arrows provided for messages/thread	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User can collapse/expand threads	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User can create/modify a forum	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Messages							
Supports noncoded formatting: tabs/bold/italic	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Messages can include bullets/attachments/links	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
User can edit/delete/preview messages	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Includes real-time chat	■	■	■	■	■	■	■
E-mails users when messages have received responses	■	■	■	■	■	■	■

N/A—Not applicable; This product is hosted on the WebEngage server. *With the administrator's permission.

Installation took only a few minutes. The package includes a built-in server, chat rooms for live discussions, and excellent documentation and wizards for hassle-free administration. WebBoard bundles an extensive set of administrative



WebBoard lets you reset hits for the server with the push of a button.

tools, including wizards for archiving messages and adding a conference or a user. Message control is granular, letting you restrict forum membership and the implementation of active links and file attachments. Most notable is the power to retrieve archived messages and add them to a discussion under a new topic.

The package contains good moderation tools but lacks content filtering. An administrator can set a discussion as moderated, specify a moderator, and if the conference is private, list users to be granted access. The moderator can approve messages without reading them, edit and post them, or delete them.

WebBoard is fully customizable, but unlocking this control requires advanced skill in HTML editing and familiarity with

JavaScript. WebBoard gives you access to all HTML files, so you can change anything from the design of the New User Information form to the graphics display in the toolbar file. The manual includes a well-referenced section on the purpose of each WebBoard HTML file.

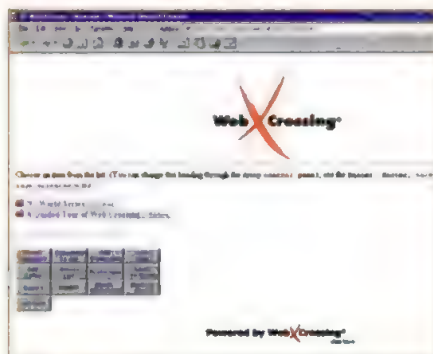
WebBoard's user interface is bland, but its feature set is rich, including deep message threading, e-mail notification, support for file attachments, and a spell-checker. In addition to good searching and sorting capability, there's a unique feature that lets you locate other users by typing a user name or by pressing a letter of the alphabet in a special search form.—*DAL*
WebBoard 2.0. List price: 2 Virtual Boards, 10 conferences each, \$59.95; WebBoard 2.0 XL with 255 Virtual Boards, unlimited

[illegible]

Web Crossing

The setup wizard makes installation easy. The configuration utility makes it

easy to turn Web Crossing on or off and provides a quick way to monitor the server status. Administration is simple. Discussions are organized within folders and displayed as icons, and folders can be nested. We found it easy to set restrictions within a given folder, prohibit the creation of additional folders, or restrict a folder to accept only discussions and not



Web Crossing provides many tools from an easy-to-access control panel.

nested folders. The administrator can implement user-level security, which lets users add, edit, or delete messages based on their status.

There is no moderation or filtering, but a unique feature that places new users under provisional status gives you control over the discussion. Any posting made by a moderated user is forwarded directly to the administrator, who can then edit, reject, or approve the message.

Despite administrative limitations, Web Crossing is one of the most extensible products in the roundup. Lundeen & Associates provides Web Crossing Template Language (WCTL), a native scripting language that gives you the power to customize nearly every aspect of your discussion site. Although WCTL is proprietary, any administrator familiar with scripting languages can master it quickly.

Web Crossing's end-user capabilities are unsophisticated. Posting messages is not difficult, but the program is a bare-bones affair that lacks support for embedded attachments or links.—*HHH*

Web Crossing 2.0.2. List price: \$995 and up. Requires: 486-based PC or better, 16MB RAM, 10MB hard disk space, Microsoft Windows 95 or NT 3.51 or later. Lundeen & Associates, Alameda, CA; 510-521-5855; fax, 510-522-6647; www.lundeen.com. Choose 507 at www.pcmag.com/infolink.

Well Engaged

Well Engaged Discussions

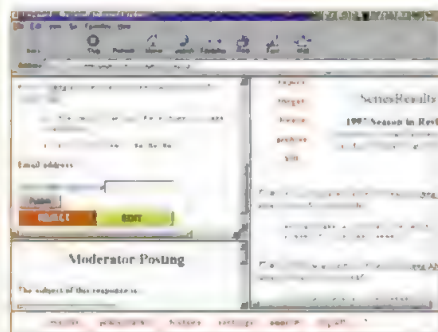
Administrators of large commercial sites looking to avoid the hassles of building and maintaining a discussion server should consider Well Engaged Discussions (\$3,500 list, plus monthly charges). The product provides an excellent linear discussion model that features moderation, filtering, and a spell-checker. Message threading would make the product complete.

Setup consists of giving the company your customization requirements, graphics, and HTML; Well Engaged does the rest. The price includes up to 35 hours' setup and training; more costs \$100 per hour. If you need further modifications, Well Engaged will implement your changes quickly.

Well Engaged Discussions gives the host user excellent moderation control. You can post or reject responses, edit posts, and specify where in a thread they belong. The filter blocks profanity and lets you add words to the "forbidden" list. Because the list is case-sensitive, new words must be entered in multiple ways.

The user interface is broken down into Conferences and Topics. Conferences are global organizational folders; Topics are folders within Conferences that hold individual discussions. Users can temporarily hide topics by marking them as *forgotten*, and the administrator can archive topics or “freeze” them, designating them read-only. You can also tag topics with a placemark.

Well Engaged Discussions offers a mix of searching and sorting options. The ability to search user profiles by geographical area or interests is unique. This product, the most sophisticated linear implementation we tested, lets you go to a posting by number, to the start of a discussion, and



Well Engaged Discussions' moderator view lets you specify where to publish a posting.

Web-Based Discussion Software

forward or back by increments of 20 messages. Although not as straightforward as the collapsible threads used by Expressions or WebBoard, Well Engaged Discussions' implementation is far easier than scrolling through the myriad documents in FirstClass or the Web-based version of Wildcat! Interactive Net Server.

Well Engaged Discussions offers basic messaging tools. Messages are entered as plain text, with no support for formatting or file attachments. However, a unique "hide" feature lets you collapse a long response, displaying it as a link in the discussion—a clever way to help users weed through tons of information quickly. The product's spell-checker features a customizable dictionary; the utility flags unrecognized words and lets you edit your response before posting.—*Greg Alwang*
Well Engaged Discussions 1.5. List price: Hosted version, \$3,500, plus \$250 a month for 101 to 500 users (no monthly fee for fewer users). Requires: Internet Explorer 3.01 or later or Netscape Navigator 3.0. Well Engaged, Sausalito, CA; 800-935-5880, 415-332-4335; www.wellengaged.com. Choose 508 at www.pcmag.com/infolink.

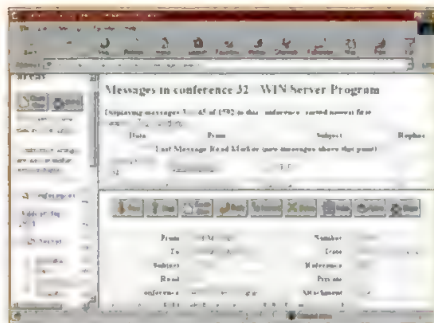
Mustang Software Inc.

Wildcat! Interactive Net Server

Wildcat! Interactive Net Server, Enterprise Edition (\$3,995 list), is a Web-enabled version of Mustang Software's dial-up BBS program. Although BBS operators may appreciate the Web-based capabilities, administration controls, and customizing options, WIN Server's cluttered end-user interface and default linear messaging may make it a tough sell for everyone else.

Installation is simple, but using the management tools is much less straightforward. Like most BBS software, WIN Server requires many different tools to configure its various product components—a cumbersome and time-consuming process. The flexible forum administration tools let you define forums as private, public, or moderated. There are automatic message expiration and archiving capabilities. A unique replication feature lets you export and replicate conferences to remote servers.

You customize the discussion site by editing HTML templates for specific site types, such as business, church, or school.



Viewing WIN Server messages takes plenty of scrolling and frame resizing.

If one of the templates meets your needs, you'll be up and running quickly.

The user interface includes frames and no-frames versions, though we found the frames version poorly designed. Because the server didn't synchronize the frames properly, we wound up with multiple frames containing duplicate information, frames within frames, and frames out of sync with other frames. Message threads are linear and are displayed by top-level messages only, with postings displayed in reverse chronological order. A dividing line indicates where you left off reading.

More extensive end-user capabilities are available with Wildcat! Navigator, a free browser-launched application. It provides enhanced message display controls, threaded discussions, improved search functions, and message attachment capabilities.—*SG*

Wildcat! Interactive Net Server, Enterprise Edition. List price: \$3,995. Requires: Pentium-based PC, 16MB RAM with Microsoft Windows 95 or 32MB RAM with Windows NT 3.51 or 4.0, 200MB disk space. Mustang Software Inc., Bakersfield, CA; 800-999-9619, 805-873-2500; www.mustang.com. Choose 509 at www.pcmag.com/infolink.

DigitalFacades Corp.

Xpound!

Unix-based Xpound! HT 2.21 (\$1,195 list) is an easy-to-install package that includes rich filtering, searching, and sorting features. But it's difficult to customize, it's slow, and it provides limited end-user message control.

Installing Xpound! is easy, and its documentation is sparse but adequate. The product runs on any Web server that uses Perl CGI with DBM (database management) support. A Windows NT version should be available by press time.

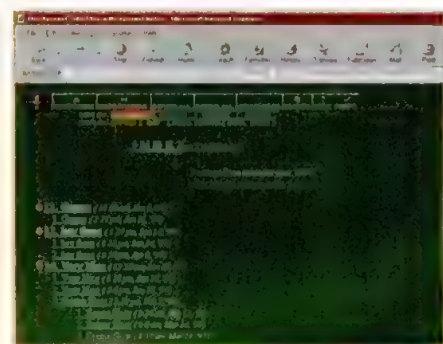
Administration is also straightforward: New users can either auto-register or access public forums as guests. Forums can also be private. Xpound! offers basic moderation and content filtering, but you'll need to build your own profanity list. And because the program lacks any smart logic for rejecting word variations, a word must match an entry exactly.

We found customizing the discussion site laborious. Because the interface design uses a separate set of HTML pages that use proprietary tags, making changes involved editing each page by hand.

The user interface is fairly good; the collapsible threads are indented for easy reading. The program tags each new message with an icon, and it can display new messages by day, week, month, or year. But though DigitalFacades Corp. claims you can edit and delete individual messages, we were able to delete only entire threads.

Xpound! includes fine searching and sorting tools. You can search by subject line, subject line and content, or author. And registered users who have set certain messages to use auto-notification can search for them if they want to turn off the feature. The program can sort by date and time, subject, author, and threads' traffic level.

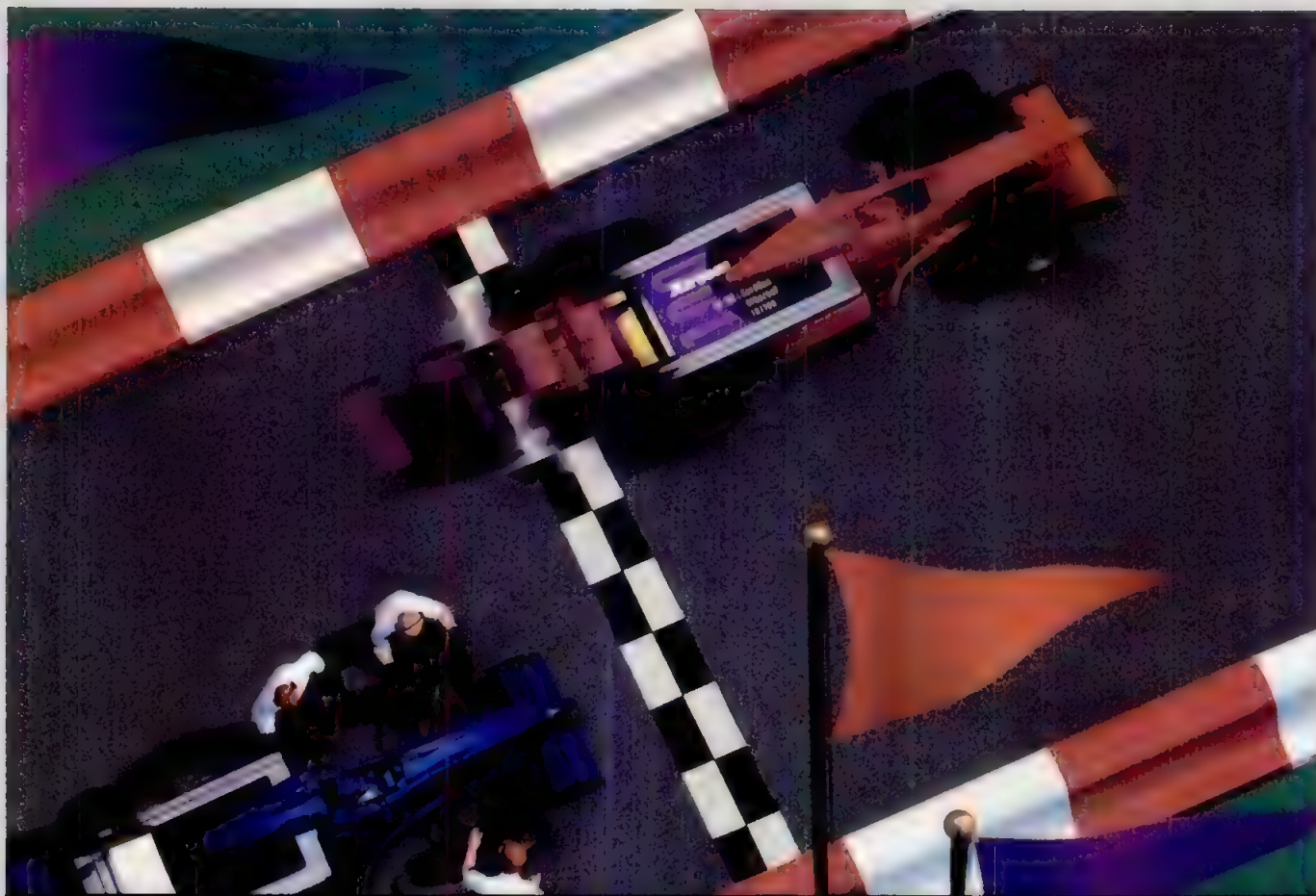
Xpound!'s performance proved to be noticeably slower than the other packages' because of slow CGI execution of Perl



Xpound!'s toolbar gives you one-button access to all navigational tools.

scripts. The company plans to address this problem in a future release by implementing either FastCGI or Java.—*SG*

Xpound! HT 2.21. List price: \$1,195. Requires: Unix-based system with Perl CGI and DBM support, cookie-enabled Web server. DigitalFacades Corp., Santa Monica, CA; www.xpound.com. Choose 510 at www.pcmag.com/infolink. **PC**



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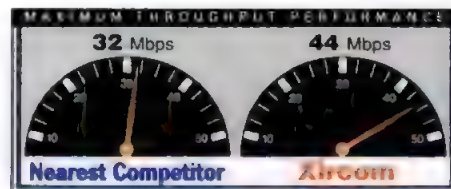
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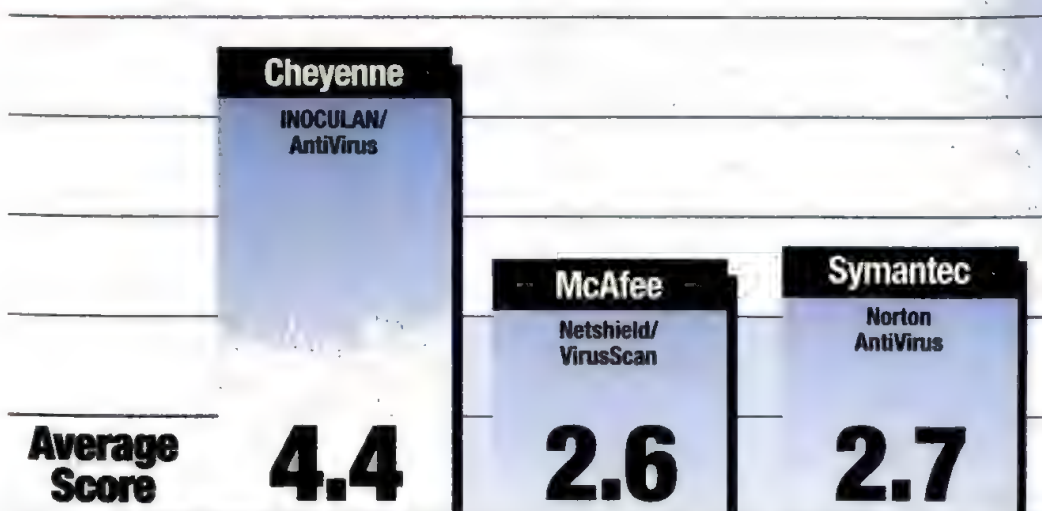


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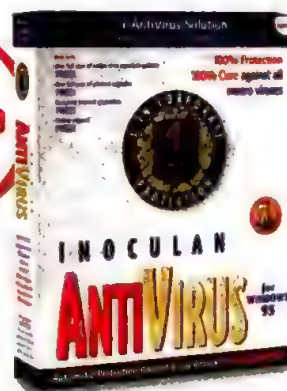
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Net Tools



Getting on the *Fast Stack*

Stackable Fast Ethernet hubs are less expensive, more flexible, and easier to manage than ever before.

By Steve Rigney

You dream of switching your existing 10-Mbps nodes to 100-Mbps Fast Ethernet, but reality gets in the way. A tight capital budget, print and fax servers with 10-Mbps Ethernet connections, and older PCs create roadblocks. Fortunately network vendors have turned these issues into mere speed bumps with new, affordable stackable hub products that let you upgrade your Ethernet network to Fast Ethernet in an incremental fashion.

In this roundup, we look at six manageable and

stackable 100-Mbps hubs from market-leading networking vendors: the BayStack 202 100 Mb/s Ethernet Hub, Compaq Netelligent 3612 Managed Hub, HP AdvanceStack 100 Base-T Hub-12TXM, Intel Express 10/100 Stackable Hub, SMC TigerStack 100 5312TX, and 3Com SuperStack II Hub 100-TX. Each product we tested provides 12 100Base-TX ports and some type of network management capability. All of the vendors except 3Com also offer 24-port models for additional port capacity. Most let you connect to existing 10-Mbps segments, and the Intel unit even lets

INSIDE

FAST ETHERNET PC Magazine Labs and contributing editor Steve Rigney test six stackable Fast Ethernet hubs for performance, scalability, and management options.



NETWORK MANAGEMENT

Version 6.0 of Intel's LANdesk Management Suite is here with new features and improved ease of use. Find out what happened when Steve Rigney puts the latest version of this product through its paces. *Page 209.*

ISDN FOR THE SMALL OFFICE

Contributing editor Les Freed and PC Magazine Labs test the new 3Com OfficeConnect ISDN LAN Modem and find the word *modem* to be an understatement. *Page 209.*

IP, THE NEXT GENERATION

Confused about all the hoopla surrounding IPv6 and what it means to you? Senior networking editor Frank Derfler explains it all in this issue's Internet Tools. *Page 213.*



USB IN MULTIPLE ACCESS

Frank Derfler tells you how the new 12-Mbps Universal Serial Bus will revolutionize the way you connect your peripherals to your PC. *Page 210.*

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you mix 10-and 100-Mbps ports in the same stack.

NO PERFORMANCE ANXIETY

Price and performance are usually important considerations in purchasing new hardware. In this case, however, all the products tested yielded roughly the same performance (for more details, see the sidebar "How We Tested"). This means you can concentrate on which vendor gives you the most bells and whistles for your dollar. The managed price per port of these 12-port hubs ranged from \$142 for the BayStack 202 to \$252 for the Netelligent 3612. Half of the vendors in this story include management, and half offer management as an option, so we based our price per port on the cost of the hub with management.

After price per port, the next question in your mind should be the product's scalability. With the exception of the Netelligent 3612 and the AdvanceStack, each of which can handle a maximum of only five hubs in a stack, the products in this roundup let you link up to eight hubs together in a single stack.

Except for the SuperStack II, all the hubs we tested are Class I repeaters, which are limited to a single repeater, or stack, per segment. Class II repeaters such as the SuperStack II can handle two repeaters—or stacks—on the same segment.

If you want to connect multiple Class I repeaters together you must connect them via an Ethernet switch. Fortunately Compaq,

Net Tools

STACKABLE HUBS

HP, Intel, and SMC Networks offer optional internal Ethernet switches that let you daisy-chain multiple hubs together or connect them to another device. Most of the internal switches work with both 10-Mbps and 100-Mbps connections, so you can use them to connect a new 100-Mbps stack to your existing 10-Mbps network.

For added flexibility, the Compaq and SMC hubs also include internal segments within the stack. For example, you could configure two hubs in a stack to handle traffic for the accounting department and the other hubs to provide connectivity for all the rest of your departments. The Compaq unit provides 3 internal segments for the entire stack, while the SMC hub provides 12 segments in a complete stack of its 12-port hubs.

MANAGING THE STACK

Once you've invested in a 100-Mbps network, you'll want to make sure that it stays up and running. The surest way to do so is to take advantage of the vendor's management products. All of the products in this roundup provide SNMP management. Only Bay Networks, Compaq, and HP include this management capability within the base price of their products, however. The other vendors offer management as an option priced from \$955 to \$1,495.

Bay Networks and Intel provided our two favorite management solutions. Both vendors include HTML-based management ap-

plications with their products, but that is where the similarities end. The BayStack 202 includes a Web server, so you need just a browser to manage the device. The Express 10/100 requires you to install software on an existing Microsoft Internet Information Server, because the hub doesn't contain a Web server.

With the exception of the SuperStack II, all the products include proprietary Windows-based management utilities. Compaq's management software was our preferred solution, because in addition to providing a graphical depiction of the hub, it can also produce real-time graphs of network traffic. SMC's utility is powerful, but unfortunately it doesn't work with Microsoft's TCP/IP stack, which comes bundled with Windows 95 and Windows NT.

At least one of these products will meet your individual budgeting, networking, and administrative needs.

BayStack 202 100 Mb/s Ethernet Hub

ALL REVIEWS BY STEVE RIGNEY

Though it's the least expensive hub in this roundup, the BayStack 202 100 Mb/s Ethernet Hub, from Bay Networks, doesn't sacrifice management for a reasonable price. Along with the Intel Express 10/100 Stackable Hub, it's one of only two products in this roundup that come with both Windows- and Web-based management. The BayStack 202 also comes with two internal 100-Mbps segments and is capable of connecting up to

SUMMARY OF FEATURES

Stackable Fast Ethernet Hubs

	BayStack 202 100 Mb/s Ethernet Hub	Compaq Netelligent 3612 Managed Hub	HP AdvanceStack 100 Base-T Hub-12TXM	Intel Express 10/100 Stackable Hub	SMC TigerStack 100 5312TX	3Com SuperStack II Hub 100-TX
■ YES □ NO □ OPTIONAL						
Price per hub	\$1,699 list	\$3,020 street	\$2,299 list	\$1,525 list	\$1,500 list	\$1,190 list
Price of tested configuration (60-port managed stack)	\$6,331 list	\$10,630 street	\$7,895 list	\$8,365 list	\$9,070 list	\$6,999 list
Dimensions (HWD, in inches)	1.7 x 17.3 x 11.5	1.8 x 14.4 x 10.1	2.5 x 17.3 x 12.0	3.5 x 17.4 x 13.0	1.7 x 17.0 x 11.3	1.7 x 17.3 x 12.0
Number and speed of ports	12 100 Mbps	12 100 Mbps	12 100 Mbps	12 10/100 Mbps	12 100 Mbps	12 100 Mbps
Maximum number of hubs/ports in a managed stack	8 / 96	5 / 60	5 / 60	8 / 96	8 / 96	7 / 91
AUI/BNC/fiber ports	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0
Expansion slots/internal segments	0 / 2	1 / 3	1 / 1	2 / 1	1 / 1	1 / 1
Type of repeater	Class I	Class I	Class I	Class I	Class I	Class II
Management						
Management software included	■	■	■	■	■	■
SNMP/RMON management	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
In-band/out-of-band management	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Audit log	■	■	■	■	■	■
Service and Support						
Warranty	Lifetime	3 years	5 years	3 years	3 years	5 years
Technical-support hours (eastern time)	24 hours, 7 days	24 hours, 7 days	3:00 A.M.-2:00 P.M. M-F	4:00 A.M.-2:00 P.M. M-F	8:30-8:00 M-F	9:00-8:00 M-F

eight hubs together in a single stack. We found, however, that it lacks some essential features, such as an optional switch port for cascading other hubs to the stack and MAC-level port security. Nevertheless, if you don't need these features, the BayStack 202 is a good deal.

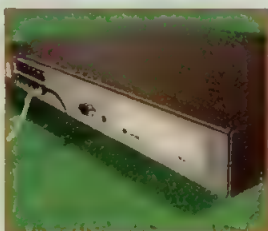
The BayStack 202 retails for \$1,699 and comes with 12 100Base-TX ports and a built-in Network Management Module (NMM). Bay Networks also offers the BayStack 203 (\$2,099 list), which is essentially the same unit with a 100Base-FX fiber transceiver you can use to connect to your existing fiber backbone.

Like the other hubs in this roundup, the BayStack 202 is housed in a standard 19-inch chassis. But unlike other vendors, which often place the RJ-45 ports in a single line across the front of the hub, Bay Networks uses two rows of six ports. Unfortunately, the unit's link LEDs are not positioned above the ports but grouped together to the side, making it difficult to see which port has a link to an active node. The BayStack 202 also lacks LEDs that display per-port activity.

In an attempt to provide information at a glance, Bay Networks has placed a basic utilization counter on the front of the BayStack 202. The counter displays exact data when network utilization ranges from 1 percent to 25 percent. Unfortunately, once network utilization passes 25 percent, the counter won't display the actual percentage of utilization. If you need this data, you'll have to check the management utility.

Like the Express 10/100, the BayStack 202 can be managed via its Windows-based console or from a Web browser. The major difference between the Web-based management of these two products is that the Intel unit relies on the presence of an existing Microsoft IIS server on the network, while the BayStack 202 comes with its own internal Web server. Both let you gather statistics such as the number of collisions and amount of traffic on the port, but the Intel unit's interface provides better graphics.

Before you can use the NMM's Web server, you must first use a console to provide the hub with an IP address. Alternatively, the NMM can lease an IP address from a BootP server on your network, though this solution caused us some problems during installation. After we assigned an IP address



WHO'S ON FIRST?
The BayStack 202's link LEDs are grouped separately from its ports, making it difficult to tell which ports are active.

EDITORS' CHOICE

• Intel Express 10/100 Stackable Hub



award the Editors' Choice to the Intel Express 10/100 Stackable Hub based on its flexibility, scalability, and manageability.

The Express 10/100 is the only product in this feature that can accommodate both 10- and 100-Mbps managed Ethernet hubs within the same stack. It also provides the most complete set of management options. In addition to standard SNMP support, the Express 10/100 offers an excellent Web-based management application. Alternatively, you can manage directly from the front panel of the management module without using a PC or telnet connection. The only additions we'd like to see in the future are a built-in Web server (the unit requires Microsoft IIS running on an Windows NT

Our test results show that all the products perform about the same. Therefore, we sought out the hub that provides the most features for the lowest price. We

server) and MAC-layer port security.

An honorable mention goes to the BayStack 202 100 Mb/s Ethernet Hub. The least expensive product in this roundup, the BayStack 202 includes a strong Web-based management application and two internal segments. Noticeably absent, though, is an optional 10/100-Mbps switch port that would allow the BayStack 202 to cascade and connect to a 10-Mbps network.

The SMC TigerStack 100 5312TX also earns an honorable mention. We found that the TigerStack possesses a wealth of options, but its management software doesn't work with Windows 95's or Windows NT's IP stack. The unit's LEDs were among the most informative in this roundup.

to the device, we couldn't connect to it from our browser. It took us half an hour of scanning through the thick BayStack 202 manual

to learn that the NMM's default configuration boots from the network, using a service such as BootP. Until you change the start-up settings from the console, the BayStack 202 won't recognize your manual network settings.

BayStack 202 100 Mb/s Ethernet Hub. List price: \$1,699. Bay Networks, Santa Clara, CA; 800-822-9638, 408-988-2400; fax, 408-988-5525; www.baynetworks.com. Choose

902 at www.pcmag.com/infolink.

Compaq Netelligent 3612 Managed Hub

Though it is the most expensive hub we looked at for this roundup, the Compaq Netelligent 3612 Managed Hub provides easy installation, strong management, and solid performance. You can stack up to five of these 12-port hubs together for a total of 60 100Base-T ports, and the optional Smart Uplink module lets you

cascade even more hubs and devices together. The unit's internal 300-Mbps segmentable backplane is a useful and a fairly flexible feature for dividing up your network traffic. And the bundled management software is top-flight, though unlike the Bay Networks and Intel hub products, the Netelligent 3612 does not offer Web-based management.

Of all the vendors in this roundup, Compaq probably comes closest to offering all the hardware you need to install a small or enterprise-wide network, including network adapters, hubs, switches, and even servers. But while it includes management software, the Netelligent 3612's \$3,021 list price doesn't buy you everything. You'll probably need to purchase certain options in order to get total functionality. For example, the backplane cables that connect the hubs together in the stack are not included in the base price and sell for \$88 each. The optional redundant power supply will run you another \$259. And if you want to cascade hubs, you'll have to spend \$649 for the 100Base-TX uplink module. (A 100Base-FX model is also available.)

Like most other hubs in this roundup, the Netelligent 3612 is a snap to install and is extremely configurable. Connecting hubs in a stack required proprietary Compaq cables; you daisy-chain the units using connectors located

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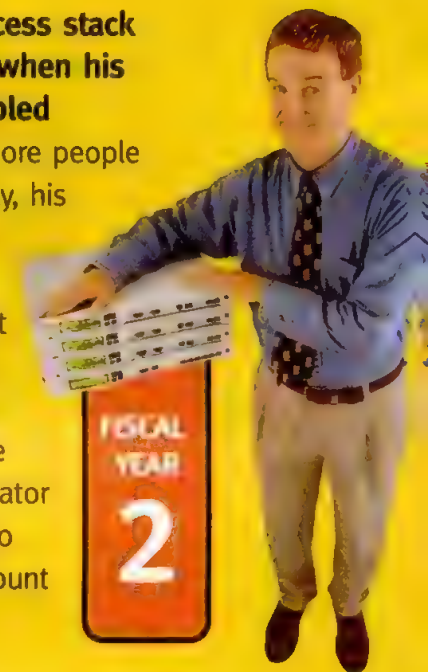
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that Jack built when he
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**The remote access stack
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workforce doubled**

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REMOTE ACCESS 3000 COMPETITIVE ADVANTAGES

	3Com Remote Access 3000	Unigenet Rmg	Accord 4948	Claro 5200	Bay Networks Bbox	Shiva Dsl
Product Features:						
Number of Ports	24-144	24	48-144	24-48	24	24-48
Hot Swappable	Yes	No	No	No	No	No
Configuration Time (Hours)	1	2	2	2	2	2
Redundant Power	Yes	No	No	No	No	No
32-bit Technology	Yes	No	No	No	No	No
Total Control Technology	Yes	No	No	No	No	No

Built as He Grew His Business.

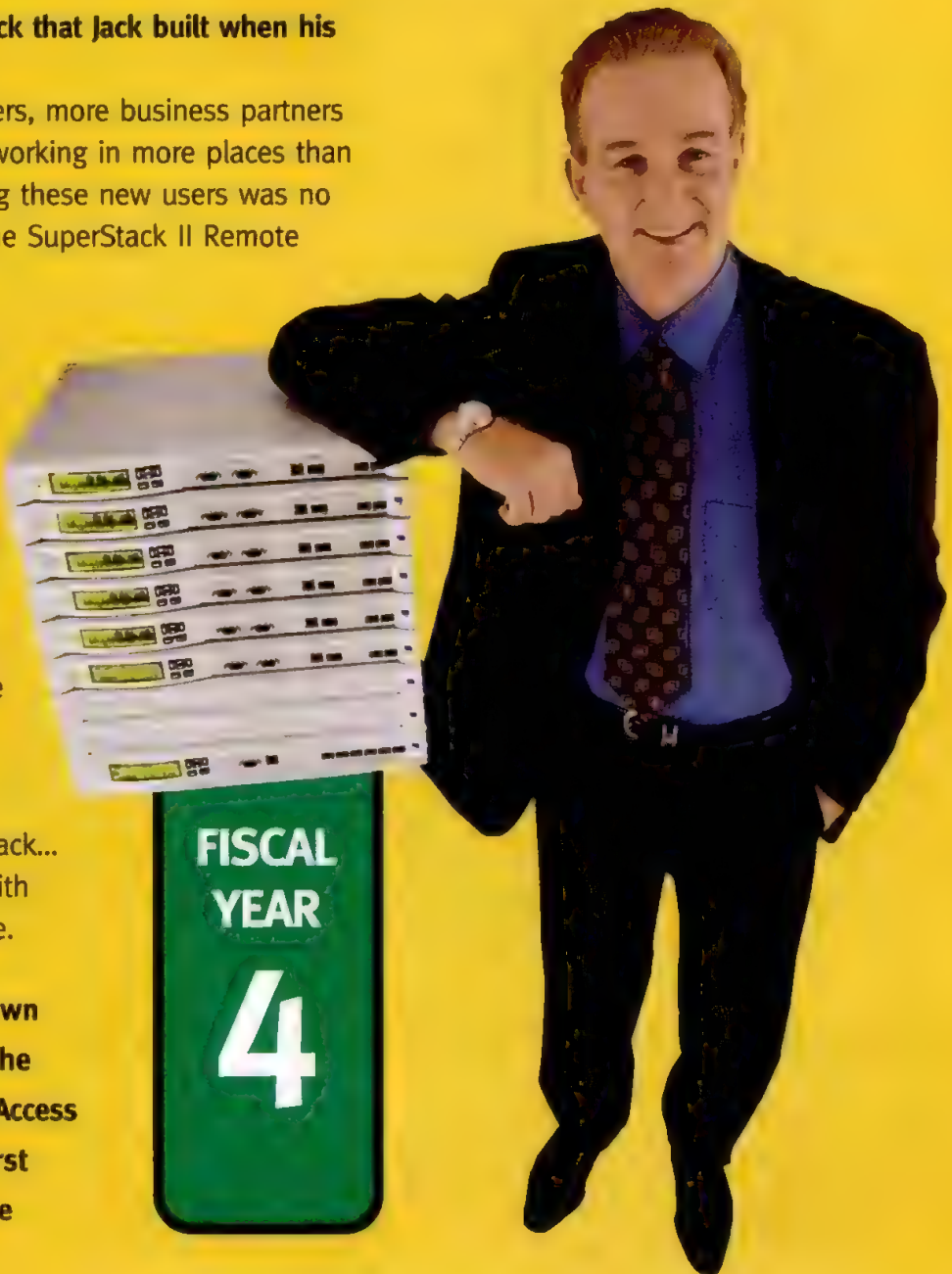
The remote access stack that Jack built when his revenues doubled.

Jack has more customers, more business partners and more employees working in more places than ever before. Supporting these new users was no problem... thanks to the SuperStack II Remote Access 3000 system.

Jack simply stacked on more modules and ensured system uptime by adding RPS 3000 redundant power supplies. Now he can support 720* remote users with the same Access Router he purchased when he started his business.

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on the back of the chassis. The chassis includes LEDs for each port, as well as one for each of the three backplanes in the stack, an LED for collisions, and an LED for management status.

The bundled Netelligent Management Software (NMS) communicates directly with the SNMP MIBs (management information bases) and RMON agents located in the hub. NMS gathers detailed statistics about port and backplane usage and can create both numerical tables and colored bar graphs summarizing overall usage and traffic across the hub. It also works as a plug-in to Compaq's server management application, Insight Manager.

Our favorite NMS feature is its ability to create a graphical topology map of your network that shows where all your servers and hubs are located. On our tests, we were able to create a hierarchical map of our network complete with servers, clients, and hubs. You can also create maps of different locations and network subnets.

Compaq Netelligent 3612 Managed Hub. Street price: \$3,021. Compaq Computer Corp., Houston; 800-345-1518; fax, 281-518-1442; www.compaq.com.

Net Tools

STACKABLE HUBS

HP AdvanceStack 100 Base-T Hub-12TXM

Providing one of the most informative front panel displays we've seen, the \$2,299 HP AdvanceStack 100 Base-T Hub-12TXM, from Hewlett-Packard Co., is a solid investment. We like its optional switch port and its ability to cascade multiple stacks together. Our only complaint is that the hub lacks detailed graphical management. As long as you don't mind using a terminal or a telnet session to configure and monitor the unit, the AdvanceStack should work fine.

BENCHMARK TESTS

Stackable Hubs



Our throughput tests show equivalent performance for all the products in this roundup. Hence, when you are considering Fast Ethernet hubs for your

LAN, you should compare scalability, management, and ease of use.

What the Numbers Mean

When considering stackable hub performance, two aspects are important: How well do individual hubs perform, and does the stacking technology degrade that performance? Even before testing, we suspected there would be little performance difference among individual hubs. Unlike the port-switching hubs we reviewed in our issue of December 16, 1997 ("Segment Sensitivity"), stackable hubs merely repeat the electrical signals they receive. Hub vendors must follow the rules defined for repeaters by the IEEE (Institute of Electrical and Electronics Engineers). Since these rules include such things as "start-of-packet propagation delay"—the delay between the time the repeater receives the signal and the time it repeats that signal—the vendors don't have much room to make performance enhancements of their own. On the other hand, the stacking technology used to link the hubs together into a single Ethernet repeater is completely proprietary and therefore is a possible source of performance differences among products.

We performed several tests designed to tax the different stacking technologies. First we ran a baseline test on all of the products as standalone (nonstacked) hubs. As expected, these results were extremely close, and we didn't see a clear winner. We then stacked the hubs, spread the clients across the stack, and reran the same test. The throughput variations were so small that they fell within the standard margin of error for our benchmark tests.

We then expanded our test, filling up the five-hub stacks with 56 clients and 2 servers. By introducing a second server, we ensured that the hubs were the network bottleneck rather than an individual server or server NIC. We allowed half of the clients to create background traffic and the other half to run full the throughput test. The results are shown on the right. This test easily saturated the hubs, but we still saw little in the way of differences. Consider-

ing that most networks won't operate with anywhere near the kind of load we placed on our test-bed, we suggest you make your stackable hub purchasing decisions based on the features each family provides or what your budget will allow.

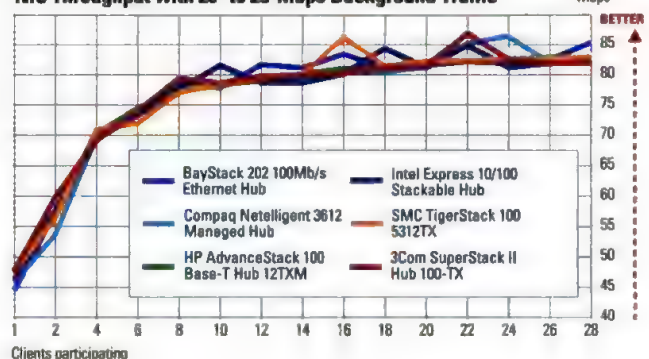
How We Tested

To establish an initial baseline, we placed ten clients, one server, and one NetBench controller on a single hub. We then used the ZD NetBench 5.01 NIC Throughput test to create as much traffic as possible and recorded the throughput. After this baseline test, we stacked five matching hubs from each vendor, spread the clients evenly across the stack, and repeated the test. This forced traffic out into the proprietary backplane system of each vendor's stack.

To test stack performance we placed two servers on the five-hub stacks. We used 1 server and 28 clients to create three levels of background traffic using our WebBench 1.1 benchmark tests: 10 to 15 Mbps, 20 to 25 Mbps, and 45 to 50 Mbps. To customize the level of background traffic, we introduced a wait time into WebBench. Because of the programmed delays, the timed NetBench clients could starve out the WebBench clients. At high client counts, WebBench throughput in fact dropped to the 5- to 10-Mbps level.

We used Dell Dimension XPS Pentium/166s running Windows 95 with 16MB of RAM and Intel EtherExpress PRO/100B NICs as our test-bed clients. Our NetBench server was a Compaq ProLiant 6000 with two Pentium Pro/200 processors, 256MB of RAM, and a Compaq Netelligent 10/100 NIC running Windows NT 4.0. The WebBench 1.1 server was a Hewlett-Packard NetServer E 40 with one Pentium Pro/200 processor, 128MB of RAM, and an Intel EtherExpress PRO/100B NIC.—*Analysis written by Kevin Intel*

NIC Throughput with 20- to 25-Mbps Background Traffic



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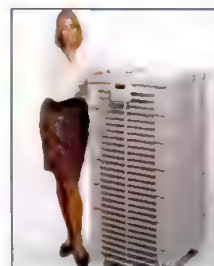
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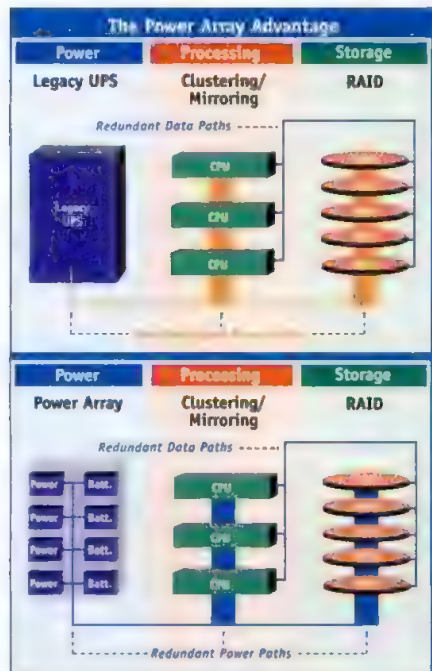
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Top: Legacy UPS, a single point of failure, protecting redundant processing and storage devices can decrease overall availability. Bottom: Power Array technology (Power, Battery and Intelligence modules automatically plug into parallel backplane) matches the modularity, redundancy and scalability of RAID and server clustering to increase overall systems availability.

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Net Tools

STACKABLE HUBS

The AdvanceStack provides 12 100Base-TX ports—and you can stack up to five hubs together for a total of 60 ports. You can use a single

AdvanceStack to control four unmanaged HP 12TX hubs (\$1,149 each) in a single stack. Unlike the Netelligent, the AdvanceStack provides only a single 100-Mbps backplane. HP also offers an optional \$499 switch port that allows you to connect the hub to other devices, including other AdvanceStacks.

We found the LEDs on the front panel extremely useful. With a quick glance you can see the percentage of network utilization and the number of collisions and link states. You can also see whether the hub is managed or not and whether it's being used as a master or backup management device. We liked the unit's single Medium Dependent Interface (MDI) uplink port, which lets you connect the hub to a switch without using a special crossover cable. Unfortunately, if you use the uplink port, you're left with only 11 standard connections.

Getting the hub up and running is straightforward. Plug it into the wall and connect all of your nodes to the available ports. The hubs stack together using short cables and connectors located on the back of their chassis. Luckily, each hub comes with a backplane cable.

To use the bundled HP Assistant software, you need to connect a terminal to the front management console port. After you have established a terminal connection to the unit, you can assign an IP address and begin using telnet or the Windows-based HP Assistant to configure the product. The AdvanceStack can lease an IP address from a BootP server, but it

doesn't work with DHCP at present.

HP Assistant is bundled with all of HP's managed hubs and switches. Unfortunately, the agent in the AdvanceStack doesn't

work with all of HP Assistant's features. For example, we were unable to view individual ports graphically or even see traffic information. When we clicked on the icon representing the AdvanceStack, HP Assistant simply launched a telnet session to the hub. Fortunately, the telnet connection provides detailed port statistics and lets you perform other tasks, such as setting up redundant ports and implementing MAC-level security.

HP AdvanceStack 100 Base-T Hub-12TXM. List price: \$2,299. Hewlett-Packard Co., Palo Alto, CA; 800-533-1333; fax-back service, 800-333-1917; www.hp.com. Choose 903 at www.pcmag.com/infolink.

Intel Express 10/100 Stackable Hub



The versatility, scalability, and manageability of the Intel Express 10/100 Stackable Hub earned it our Editors' Choice. The Express 10/100 is the only product we tested that can function as either a 10-Mbps or 100-Mbps hub and that can be managed without a direct PC or terminal connection. It comes in both 12- and 24-port mod-

els and can be stacked up to eight units high. The basic model doesn't provide management or uplink/cascade capabilities. Both options, however, come as expansion modules that fit into the base hub unit. We liked the long uplink cables, the convenient location of

the power switch, and the Web-based management option—though you must have a Microsoft IIS server on your network.

A unique feature of the Express 10/100 is its ability to run at either 10 Mbps or 100 Mbps. This feature applies to all the ports on the hub. You will not be able to mix and match individual port speeds in a single hub, but you can mix hub speeds within the same stack. For example,

you can have seven hubs set at 100 Mbps connecting your high-speed servers and one hub set at 10 Mbps connecting all of your network printers. To change a hub's speed, you simply press a button on the unit's front panel. The basic \$1,525 12-port model does not include the LEDs for management, uplink ports, or utilization; those come with the module options.

The Express 10/100 functions as a Class I repeater and lacks any internal segments. Options include the SNMP Management Module, which retails for \$995 list; a \$595 10/100-Mbps Ethernet module, which allows you to connect to existing networks and cascade other Express 10/100 stacks; and a \$995 module that provides connectivity to a fiber-based backbone. The hub and the modules we tested are easy to install and use, and the documentation, though brief, is sufficient even for novices.

Each port has two LEDs located above the RJ-45 connector, and there is a set of unit LEDs for overall status. Reading the port LEDs was confusing: Green and amber LEDs stay on, blink, or alternate to signal different statistics. The Express 10/100 also lacks utilization LEDs: You'll need the management option in order to monitor overall traffic on the stack.

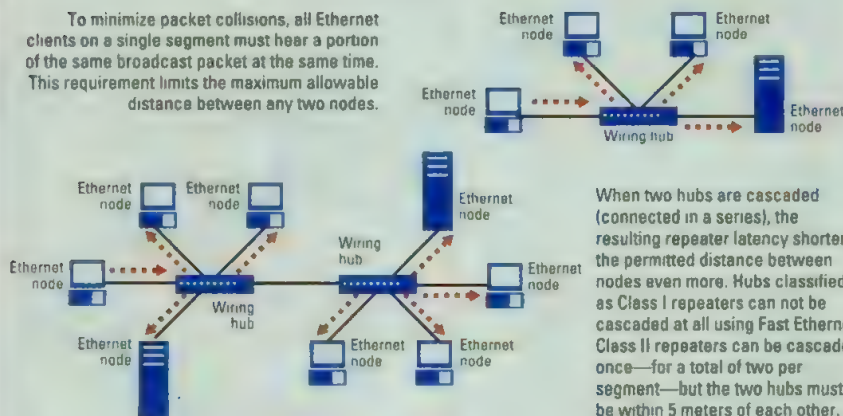
If you want detailed information about the Express 10/100, we recommend you purchase its Management Module (MM). We especially liked its front-panel LCD, which displays text-based information about the hub's status. Although you can use the console port or SNMP software with the MM, you can also use the four front-panel buttons on the MM to set the main port parameters via a basic menu system. The Express 10/100 is the only product in this roundup that lets you monitor



BRIGHT LIGHTS: The Advance Stack's useful and numerous front-panel LEDs provide detailed information at a glance.

Repeater Rules

To minimize packet collisions, all Ethernet clients on a single segment must hear a portion of the same broadcast packet at the same time. This requirement limits the maximum allowable distance between any two nodes.



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Net Tools

STACKABLE HUBS

and control crucial hub functions without using either a dumb terminal or a PC with SNMP software.

If you need more detail than the front panel on the MM can provide, you can use the included software DeviceView for the Web. With DeviceView, you can use a Web browser to monitor and configure all your Express 10/100 hubs. The software requires a Windows NT server running Internet Information Server. Using our browser, we gathered traffic statistics and other information. We could disable ports, but unfortunately the Express 10/100, like the BayStack 202 100 Mb/s Ethernet Hub, doesn't provide MAC-layer security.

Intel Express 10/100 Stackable Hub. List price: \$1,525. Intel Corp., Hillsboro, OR; 800-538-3373, 503-264-7354; fax-back service, 800-525-3019; www.intel.com/network. Choose 900 at www.pcmag.com/infolink.

SMC TigerStack 100 5312TX

If you want manageable, stackable, segmentable, and switchable attributes all in a single hub, the SMC TigerStack 100 5312TX is a good choice. The unit is one of most full-featured products we looked at, but to take advantage of all of its features you'll need to invest in a lot of separately priced options. And although its graphical management software is very useful, EliteView is a Windows 3.1 application that does not run with Windows 95's and Windows NT's native TCP/IP stacks. If you're using Windows 95 or Windows NT, you'll have to use either IPX or Novell's IP stack. The TigerStack scales up to 192 100Base-T managed ports stretched across up to 16 segments.

The TigerStack's base price of \$1,500 buys 12 unmanaged 100Base-TX ports. The Network Management Unit (NMU) costs an additional \$1,290, and the cables necessary to connect eight hubs together are \$70 each. To cascade additional hubs to the stack, you'll need to purchase the \$400 Integrated Switch Module (ISM), which requires the presence of the NMU. The ISM is available in both 10/100Base-T and fiber versions. In case you want to cascade unmanaged hubs, SMC also offers a \$400 Hub Switch Module that does not require the NSM. Other options include an RMON switching probe (\$440); a Redundant Power Unit (\$1,600); and 100Base-TX (\$160) and 100Base-FX (\$350) transceivers.

Like the Compaq unit, the

TigerStack provides internal segments that you can use to break the stack into multiple repeaters. The 12-port TigerStack provides a single segment, with eight hubs forming a full stack. The 24-port version (\$2,400) has two segments per hub.

The SMC unit has LEDs for almost every event imaginable. Whereas products like the AdvanceStack have utilization lights that provide information on the total traffic traveling through the hub, the TigerStack tops that. By pressing a button on the hub's front panel, you can switch between viewing the network utilization on a single segment and viewing the entire stack.

The TigerStack comes with an SNMP agent in the management module and the management application EliteView. The SNMP agent lets you configure and monitor all of the hubs in the stack from a terminal or telnet session. SMC says that EliteView's compatibility problems with Microsoft's TCP/IP protocol stack should be resolved in Microsoft's next version of the TCP/IP stack. Until then, you'll have to use a third-party solution or just stick with IPX. Despite its compatibility limitations, EliteView lets you see a graphical representation of all of your TigerStack products and lets you monitor alerts, events, and network traffic in real time.

SMC TigerStack 100 5312TX. List price: \$1,500. SMC Networks, Hauppauge, NY; 800-762-4968, 516-435-6000; fax, 516-273-7935; www.smc.com. Choose 904 at www.pcmag.com/infolink.

3Com SuperStack II Hub 100-TX

Starting at \$1,190 for 12 100Base-T ports, the 3Com SuperStack II Hub 100-TX appears initially to be one of the lowest-price-per-port solutions on the market. Add the management module (\$1,495), however, and its price per port is about average. And if you want graphical enterprise class management, you have to pay another \$3,495 for 3Com's management software Transcend. The SuperStack II has some commendable features, including well-written documentation, detailed LEDs on the front of

the chassis, and an optional uplink transceiver. Our only complaints are the unit's short cables and the lack of a 24-port product.

In theory, the SuperStack II should be the most scalable product in this roundup, but it doesn't live up to its full potential. Like the Bay Networks, Intel, and SMC units, the SuperStack II lets you stack eight hubs together in a single stack. But if you use the management module, you'll be limited to only

seven units in a stack. The SuperStack II should gain some scalability points as this roundup's only Class II repeater, but it only comes in a 12-port configuration, so its maximum managed port density is 182 ports between two fully laden stacks. The Bay Networks, Intel, and SMC units can provide up to 192 managed ports in a single stack when used in their 24-port versions.

The short cables that connect the stacked units were barely long enough and were extremely rigid. Consequently, all the hubs in the stack must sit directly on top of each other, and this presents a possible problem for some 19-inch racks.

The SuperStack II offers detailed LEDs on each hub, although they're not as extensive as the ones found on the Hewlett-Packard unit. Displays on the SuperStack II's front panel show which ports are in use and whether there is any activity on the port. A numeric LED lists the number of the hubs within a stack. The hub also has a temperature LED.

The optional management module is the same size as the hub and stacks with the same cables and connectors. You can manage the entire stack via a terminal connection to the module or by a telnet connection. If you want a graphical management utility, you need to purchase 3Com's Transcend software (\$3,495), which the company did not send us in time for this review. The terminal's text-based interface was hard to navigate, but after a few trips through the menus, we were able to configure individual ports and view traffic statistics. The SNMP management provides basic device information but not detailed port statistics.

As with most of the other products in this roundup, you can use the management interface to set up redundant ports and port security. **3Com SuperStack II Hub 100-TX.** List price: \$1,190. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000; fax, 408-764-5001; www.3com.com. Choose 901 at www.pcmag.com/infolink. PC



ROOM TO BREATHE:
The Intel Express 10/100 Stackable Hub's foot-long uplink cables make for easy connections.



CUT SOME SLACK:
The Compaq Netelligent 3612 Managed Hub's backplane cables are short, rigid, proprietary, and expensive.

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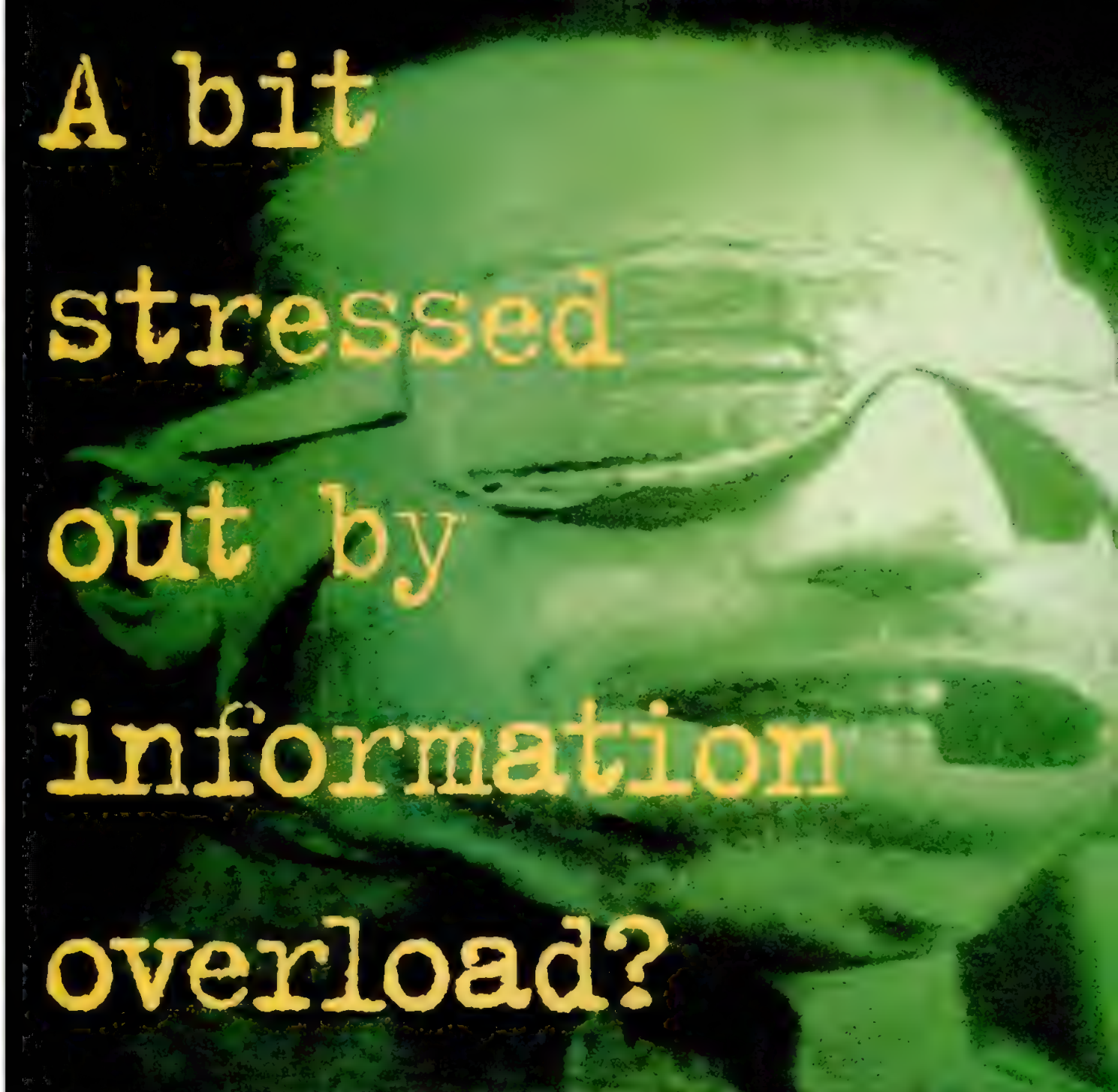
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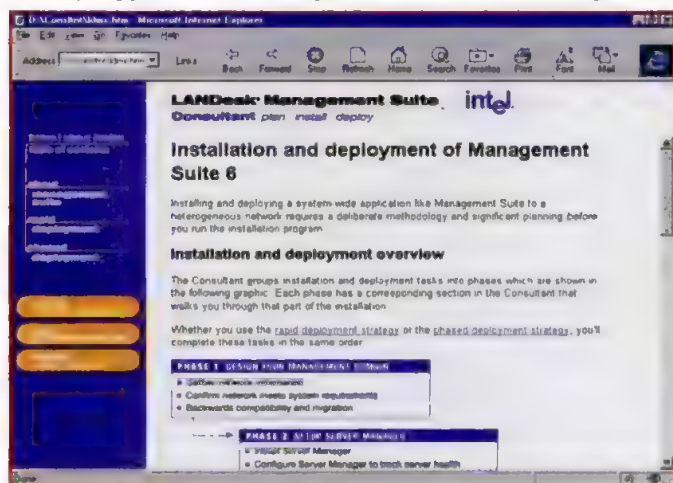
NETWORK MANAGEMENT

A Distribution Deal

By Steve Rigney

Deploying network management utilities to hundreds or thousands of network nodes is trying at best. Fortunately, the latest version of Intel's LANdesk Management Suite (LDMS) is both full-featured and easy to deploy. LDMS provides hardware and software inventory, application metering,

tant walks you through installation. The Consultant is a series of HTML documents that helps you plan and install LDMS components. LDMS tries to alleviate some of the work of installing utilities on clients by spreading the work across different servers. For example, while the core LDMS database and applications must run on a single Win-



ONLINE CONSULTANT: Intel's LANdesk Management Suite walks you through the installation process step by step.

remote control, software distribution, virus scanning, NetWare printing management, notification, server tracking, and network monitoring in a single package. The central application runs on a Windows NT server, and the application utilities work with DOS, Windows 3.x, Windows 95, Windows NT, Macintosh, and OS/2 clients. LDMS is not cheap; a five-user license retails for \$750 and a ten-user license for \$1,000.

The LDMS manuals are well written, and an online Consul-

tant walks you through installation. The Consultant is a series of HTML documents that helps you plan and install LDMS components. LDMS tries to alleviate some of the work of installing utilities on clients by spreading the work across different servers. For example, while the core LDMS database and applications must run on a single Win-

dows NT server, client services can be distributed from a separate NetWare- or Windows NT-based PC. Consequently, you can distribute software and control and meter applications on a client PC that connects to a NetWare server or a PC on a remote network. Currently, the most unusual feature of LDMS is its support for remote wake-on-LAN. The concept is simple: The network adapter in a PC keeps listening to the network if the PC is turned off. If the adapter receives multi-

ple network packets to its MAC address, it tells the system board and other components to turn on. LDMS uses this technology to send software updates to PCs during off-hours and to troubleshoot a remote PC.

The application-metering component is one of the most flexible utilities in the LDMS suite. You can use it to keep track of programs on your Windows NT and NetWare servers as well as your client PCs. You can control access to an application based on workstation ID and user name. If a license is in use, you can place the users in the queue to wait. We especially liked being able to give certain users the ability to jump to the head of the queue or to be exempted from the metering rules.

We also liked the software distribution application. We were able to create a package and send it out to all of the users on both our Windows NT and NetWare networks. You can send

software to client PCs via push, forced push, and pull. *Push* sends an update to the client PC when it logs on or at a scheduled time. The *forced push* method does the same, but the user can't cancel the update. With *pull*, the user requests software from the server.

One thing we didn't like about the product was the need for a dedicated DOS-based PC to capture detailed traffic information. The traffic monitor consists of a 16-bit monitoring application and a 16-bit application called Software Probe. You must ensure that the network adapter in the PC running Software Probe can function in promiscuous mode to capture all of the network information.

LANdesk Management Suite 6.0. List price: 5 users, \$750. Intel Corp., Hillsboro, OR; 800-538-3373, 503-629-7354; fax, 503-629-7580; www.intel.com. Choose 900 at www.pcmag.com/infolink.

ISDN ROUTERS

Making That Digital Connection

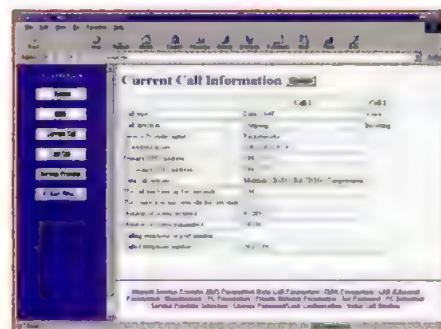
By Les Freed

Deceptively named, the 3Com OfficeConnect ISDN LAN Modem (\$499 list) is not a modem at all but a compact and effective ISDN router. The LAN Modem is the least expensive full-featured router we've tested to date and a good solution for multi-PC home offices or branch offices. Although it has features and capabilities found in higher-end routers, the LAN Modem is limited to connecting a maximum of four PCs to the Internet.

Like other products in the OfficeConnect series, the LAN Modem comes with rubber feet as well as plastic spacers that let you conserve desk space by stacking several OfficeConnect products. The LAN Modem's rear panel has four 10Base-T Ethernet connectors,

a single ISDN U interface, two RJ-11 telephone jacks, and a power connector.

To use the LAN Modem, we connected our PCs to the hub, plugged in the ISDN line, and used a browser to configure the unit. The LAN Modem hosts a small dedicated Web server that is used to enter configuration data. Like 3Com's other consumer ISDN products, the LAN Modem automatically configures itself to communicate with the telephone



WEB WITHIN: The 3Com OfficeConnect ISDN LAN Modem has browser-based configuration.

CROSS TALK



Frank Derfler

Intel and Compaq are the two big bulls challenging 3Com's turf, Leon. Intel's LANDesk Management Suite is a flanking attack into the market. It will appeal to administrators of large networks. If Intel gets their attention with this software, it can sell some hardware, too.

Management is the network hot button for 1998, Frank. Intel and others see management as the way to differentiate their motherboards, NICs, hubs, and network devices. The question is: "What is going to be done with all this data?" That's going to be the major challenge here.



Leon Erlanger

company's equipment, so you don't need to enter phone numbers and SPID information in order to get started.

In fact, all the LAN Modem really needs to know is the phone number and account information for your Internet service provider (ISP). Our test LAN Modem worked without a hitch with three

different ISP accounts.

Once you've set up the ISP account, the LAN Modem watches the LAN for Internet traffic. When it sees a packet addressed to an IP address that is not on the LAN, it automatically dials the ISP and connects your LAN to the Internet. As with high-end routers, this process is transparent to users

Net Tools FROM THE BENCH

and takes about 2 seconds. After a user-defined period of inactivity, the LAN Modem automatically disconnects from the ISP.

The LAN Modem uses dynamic bandwidth allocation to connect the second B-channel to the ISP automatically if traffic reaches a user-defined threshold. If your ISP supports it, the LAN Modem can use Hi/fn LZS to provide up to 4:1 compression of compressible data.

Like most other modern ISDN routers, the LAN Modem uses network address translation (NAT) to let PCs connect to the Internet via a single, dynamically assigned IP address. The LAN Modem also operates as a Dynamic Host Configuration Protocol (DHCP) server, so you don't even have to assign permanent IP

addresses to the PCs on your LAN. The LAN Modem can also operate with ISP-assigned permanent IP addresses.

The LAN Modem is one of the few small ISDN routers capable of connecting to two remote locations simultaneously. It stores account information for up to four remote locations and can connect to any two of them at once. This is particularly useful for branch offices that need simultaneous access to the Internet and to a corporate remote-access server.

The LAN Modem will operate with only four PCs, even if you connect it to a larger LAN via a hub. The LAN Modem stores the IP addresses of the four PCs that are allowed to access the router and ignores routing requests from all other PCs.

3Com OfficeConnect ISDN LAN Modem. List price: \$499. 3Com Corp., Santa Clara, CA; 800-638-3266; www.3com.com. Choose 901 at www.pcmag.com/infolink. **PC**

MULTIPLE ACCESS

Watch Out for USB!

Wow! I've just been blown away by the potential of the Universal Serial Bus (USB), but there's a chance that you might not make the connection. Do your PCs have USB ports? Vendors such as Compaq, Dell, Gateway, and HP have shipped PCs with these ports for almost a year. But not all PCs are created equal. The first of the sub-\$1,000 PCs we've seen are not USB-equipped. And the PCs that are may cost you more than you'd think.

If you're not sure whether a PC has USB ports, look on the back panel. If you see what looks like two coin slots for fat nickels and a logo that looks like the cherries on a slot machine, then the PC has a USB port. And that is going to open up a lot of possibilities.

USB is a 12-Mbps bus for peripherals. One cable—of a type unique to USB, as are the connectors—can carry data among as many as 127 devices, with no concerns about IRQ conflicts, DMA channels, or memory addresses. The port really comes



Frank Derfler

alive under Version 4.00950B or later of Windows 95. A small utility to test your USB ports and additional vendor information are available at www.usb.org.

The hype about USB comes primarily from the multimedia game market. USB is touted as the connection for "force-feedback" digital joysticks and mice, CD-ROM drives, and new digital monitors. In the graphics market, USB provides a convenient and efficient way to connect scanners and digital cameras to your PC. Implementing a shared USB connection is much simpler than having to multiplex a parallel port between two devices. In addition, a USB connection can make it easier and quicker to download images from a digital camera like the Kodak Digital Science DVC 300 USB Video Camera. This feature enhances consumer appeal.

But there is more to USB than a glorified game port. I see the most exciting potential application as the use of USB for what some

of the USB bigots call "legacy devices": the serial- and parallel-port products you're still buying today. A Texas company called Inside Out Networks (www.ionetworks.com) is just shipping its first Edgeport/4 expansion module, which provides four high-speed buffered serial ports at the end of a USB cable. Peracom (www.peracom.com), in North Carolina, is rolling out a similar device called USB Quad Hub. Converting USB to serial is an excellent way to connect a group of ISDN or high-speed modems to a PC. Universal Access (www.uniaccess.se), a Swedish company, expects to ship a USB-based ISDN adapter in mid-1998. Although we haven't seen any big announcements yet, USB is the obvious choice for ISDN, cable modem, and DSL connections.

Another interesting plus: USB allows peripheral sharing. Devices such as printers, scanners, and CD-ROM drives can serve more than one computer within USB's 5-meter cable length. I'm willing to bet that some smart entrepreneurs will give USB small-office networking capabilities. Those are just some of the reasons why it's important to buy a USB-enabled PC, even if it costs a little extra. After all, you don't want to save a little only to lose a lot in the long run.

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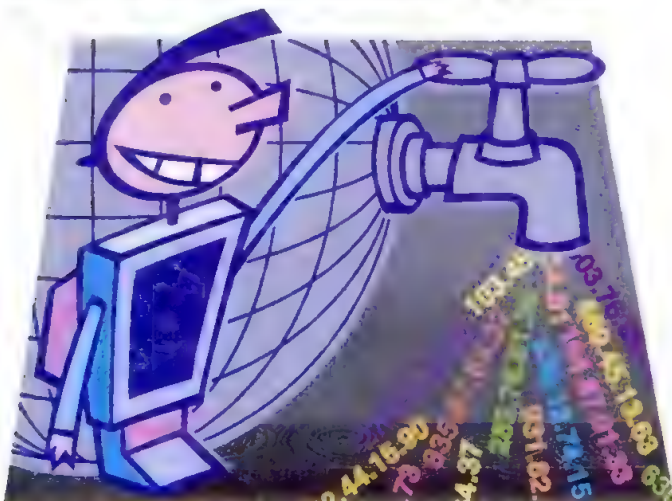
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IPv6: Will Good Sense Prevail?



By Frank J. Derfler, Jr.

The members of the Internet Engineering Task Force (IETF) must feel like the parents of a child rock star. Their offspring is subject to pressures and influences that seem beyond the parents' control. Quick wealth beckons, weirdos lurk, government officials fume and fuss, and the kid just wants to be left alone. In an effort to assert a measure of parental authority, the IETF wants to initiate IPv6, a proposed massive and fundamental revision of the way IP packets look and act. The Internet might not know it needs IPv6, but the IETF thinks it knows what's best. IPv6 (originally referred to as *IP next generation* or *IPng*) is a great idea, but it's getting lost amid the go-go drive of the Internet.

The primary impetus for developing IPv6 was to escape the limits of IP addressing in the existing IPv4 standard. When the 32-bit addressing arrangement in IPv4 was formed, no one seriously con-

sidered the possibility that growth and inefficiency would make us practically run out of numeric IP addresses.

WASTED ON SUBNETS

The way that IP addresses are grouped generates a lot of waste in their distribution. Blocks of IP addresses are assigned to individuals or organizations according to one of three categories—Class A, Class B, or Class C—described by the IPv4 standard. It's unlikely that any of the 256 Class A super organizations will need all of the 17 million nodes in a Class A block, so if even a small percentage remain unused, that translates into millions of addresses unavailable to anyone else. The same kind of waste is likely among the 65,000 unique addresses in a Class B address block. Class C address blocks, with 254 nodes, are still available for assignment, but chances are that this rigid assignment scheme will again result in a lot of unused but still unavailable addresses.

THE ANSWER IS IPV6

Enter IPv6. The addressing solution proposed under this standard is designed to expand the size of the IP address space. Lengthening the address by just 1 bit doubles the number of values it can have. So IPv6, with its 128-bit addressing scheme, allows for over 4 billion billion times the address space of IPv4. While IPv6 won't do away with the inefficiencies of IP address assignment, it will offer a nearly infinite number of addresses to waste. (For more technical details on IPv6, see www.ietf.cnri.reston.va.us/html.charters/ipngwg-charter.html.)

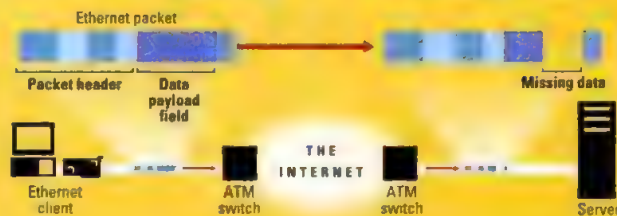
BUT WHO NEEDS IT?

IPv6 is only one solution to the addressing problems of the Internet. If those problems are your primary focus, a technique called *network address translation* (NAT) solves the same problem with fewer hassles. Known by several different trade names, such as E-Z IP in Cisco Systems' products and EasyIP in products from Ramp Networks, NAT allows organizations to make up their own nonconforming IP address schemes for internal networking. Reserved

address blocks, such as the Class A block beginning with 10.x.x.x, are intended for this purpose. You can assign one of these address blocks internally, use a proxy server to interact with the Internet, and not worry about using addresses that don't conform to the IETF addressing scheme. A proxy server presents itself to the Internet as a single conforming IP address and makes connections on behalf of the nonconforming users behind it. Using NAT causes much less demand on the pool of conforming addresses, so address waste is less of an issue.

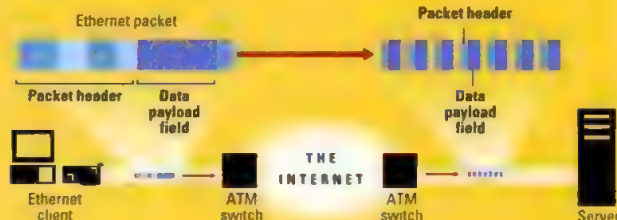
But while NAT takes much of the sting out of IP addressing on the Internet, a hierarchical network with an NAT server doesn't meet everyone's needs. For example, commercial interests and government organizations might need huge networks of remote devices such as sensors, pumps, generators, and even individual weapons. Users such as these want conforming addresses to be available without the vagaries and requirements of address translation. These users may require the practically unlimited addressing schemes offered by IPv6. Although the devices

IPv6's Quality of Service (QoS)



IPv4 When IPv4 packets travel through certain links, such as ATM switches, they are chopped into smaller cells only 53 bytes long. If

one of these small cells is lost, the bigger packet can't be reconstituted properly on the other end without significant delay.



IPv6 IPv6 checks the path between two nodes and makes sure that the payload of the largest packets is the same length as the smallest packets or

cells on the path. This prevents further segmentation and eliminates the problem of a single dropped cell delaying an entire large packet.

aren't likely to be part of the Internet, the widespread use of IPv6 lowers the cost of the technology and makes it more robust.

THE OTHER VIRTUES OF IPV6

Although IPv6's 128-bit addressing is a real plus, the specification has gained other significant features as it has evolved.

IPv4 broadcast messages have become bothersome. They clog routers and seem never to reach their legitimate destinations. Instead of multiple broadcast messages, IPv6 offers single multicast messages (going to a defined group) and "anycast" messages (which will go to any one address in a set and then quit). These IPv6 addressing options offer flexibility and reduce the traffic load.

The IPv6 protocol makes it easy for applications to ask for various levels of assured service, enhanced security, and improved reliability. With IPv6 in play, organizations can expect certain assurances regarding *quality of service* (QoS), a term that means that an application can call for the specific reliability and speed it needs to do its job. IPv6 does this by providing a way for applications to request handling without delay throughout the WAN. In sharp contrast, an IPv4 system has no way to differentiate between data payloads that are time-sensitive, such as streaming video and audio, and those that aren't, such as e-mail and file transfers. IPv4 gives the same "best level of effort" handling to each packet.

When a packet is lost in transit, TCP/IP recognizes the loss and requests a retransmission, but only after an inevitable delay. This delay and other delays caused by sorting and routing equipment are referred to as *packet latency*. High latency is deadly to audio and video data streams.

Under the IPv6 scheme, software compatible with quality-of-



service plans will have to be included on every networked device, such as routers and switches, and in every computer that runs applications. The evolving IEEE 802.1q and 802.1p standards will define how applications ask for specific quality-of-service handling across a network. The standards had their genesis in the RSVP (ReSource reservation Protocol), the User-to-Network Interface protocol designed for ATM traffic, and the real-time transport protocol described in IETF RFC 1889.

At least in initial implementations, IP drivers that conform to IPv6 will be backward-compatible with IPv4.

When an application asks for special handling, the network responds in several ways. Network devices such as routers and firewalls can establish virtual private circuits and give some packets priorities over others in order to reduce their latency. IPv6-compliant software has a trick of its own to eliminate a latency-inducing transmission phenomenon

called *packet fragmentation*.

Fragmentation is a major source of high latency under IPv4. As WANs become more diverse, the impact of fragmentation will increase. An Ethernet adapter typically sets the maximum pay-

load inside an Ethernet packet at an efficient size of 1,024 bytes. It's likely, however, that somewhere along the transmission path some link will have a smaller payload size. For example, an ATM switch in the network backbone will divide the data carried by an Ethernet packet into 20 ATM cells of 53 bytes each, with a 48-byte payload of program data in each cell. At

that amount of program data and does its own division of that data.

MAKING THE CHANGE

At least in their initial implementations, IP drivers that conform to IPv6 will be backward-compatible with IPv4, so that you won't be forced into an either/or decision. Each computer running the new protocol will

IPv6 Priorities for Congestion-Controlled Traffic

Priority level 0	No specific priority
Priority level 1	Background traffic (news)
Priority level 2	Unattended data transfer (e-mail)
Priority level 3	Reserved
Priority level 4	Attended bulk transfer (FTP)
Priority level 5	Reserved
Priority level 6	Interactive traffic (telnet, windowing)
Priority level 7	Control traffic (routing, network management)

Under IPv6, various types of data can request different priorities for handling. If a router or other network device is faced with a decision, it will give preference to the higher-priority traffic.

some time, a cell will likely be dropped or delayed. Since the single delayed ATM payload is part of a much larger packet, the bigger packet can't be reconstituted until the data lost in the smallest cell arrives. The entire packet is delayed and might even be thrown out because the smallest part didn't arrive on time. Of course, this delay raises the latency.

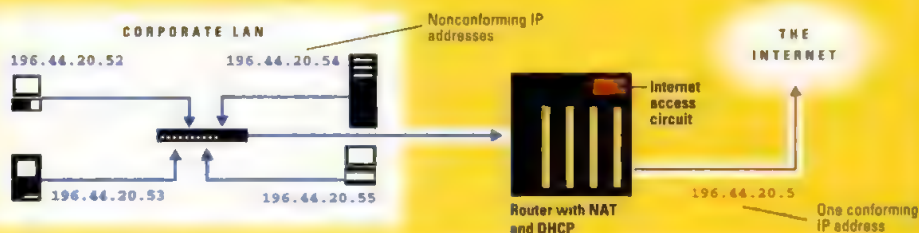
Under IPv6, though, software in the originating computer checks the path to determine the maximum payload size possible by considering links with smaller payload capability. Then it loads the originating packets with only

have two IP addresses: a 32-bit address for IPv4 and a 128-bit address for IPv6. If IPv6 routing isn't available, the IPv6 packets will flow anyway, using IPv4 routing. IPv6 will first appear in operating-system and client software packages from Microsoft, Novell, and Sun, primarily because of its multimedia capabilities. Most of us won't need the benefits of IPv6 immediately, but if your organization plans on using real-time audio or video, perhaps for desktop videoconferencing or for voice-over-IP telephone connections, then the new standard will provide significant benefits. **PC**

Network IP Address Translation with DHCP

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addresses to all network clients, and NAT routes packets between a router with a single conforming Internet address and LAN clients with nonconforming IP addresses.



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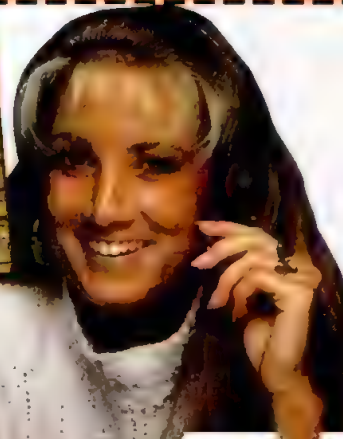
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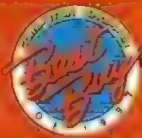
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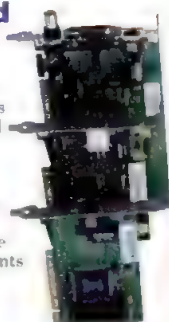
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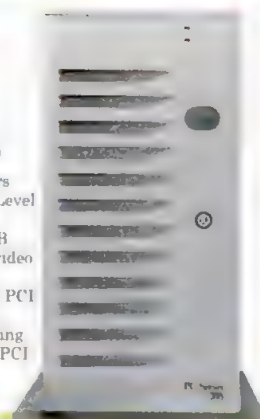
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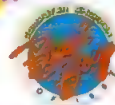
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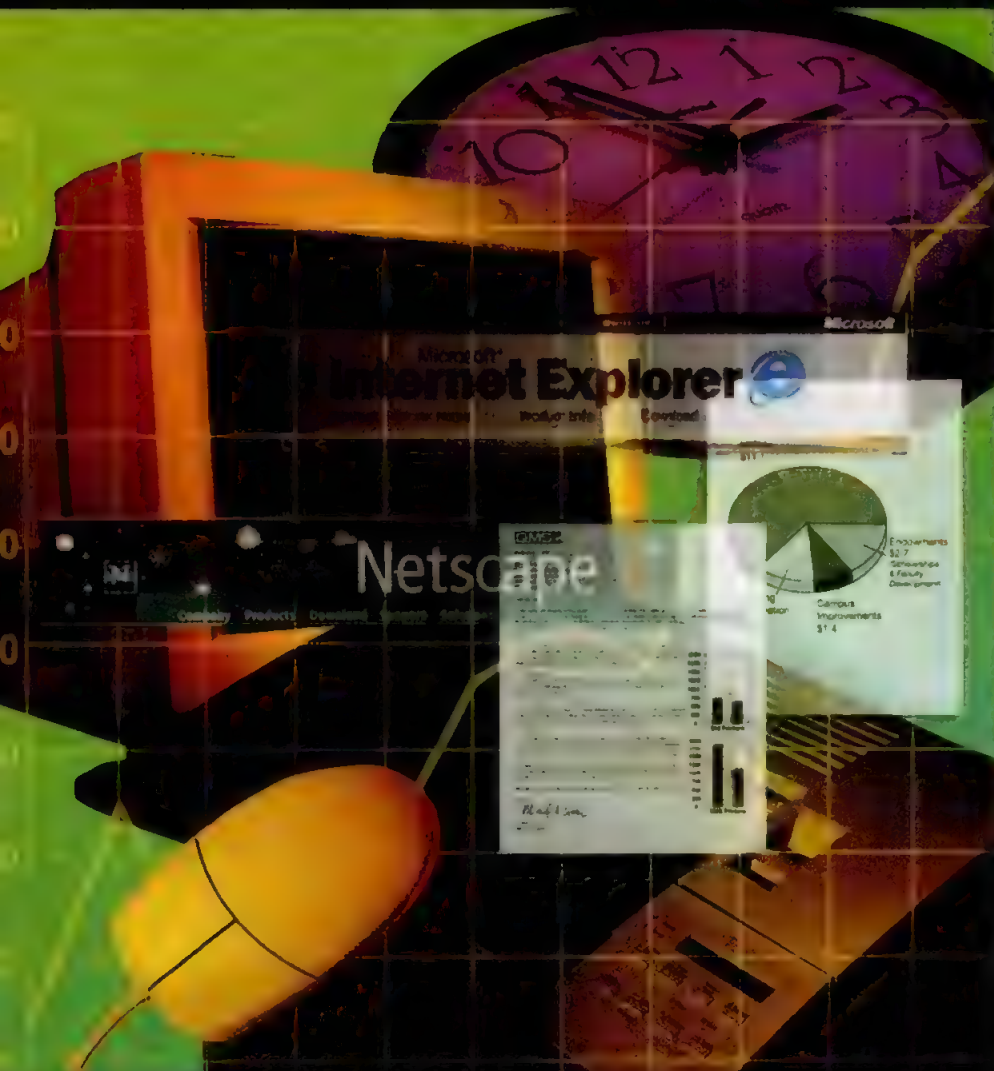
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PC Tech



Exploring Scriptlets

This new component model for Web development treats Dynamic HTML pages as self-contained objects.

By Gary Cornell

One reason for Visual Basic's enormous popularity is the component model it has pioneered. For building small to medium-size GUI applications, it yields productivity improvements and ease of use that programmers raised on Charles Petzold's classic *Programming Windows* still find hard to believe. Because a sophisticated Web-based application is essentially a small to medium-size GUI application, the obvious question is how to bring the component model of Visual Basic and Delphi to Web development. Essentially, there have been two approaches: ActiveX Controls (the same controls used so successfully in the current versions of VB and Delphi), and Java applets.

Except on Intel-based Intranets, ActiveX controls have essentially been nonstarters. In spite of some attempts at extending them to other platforms, they remain in essence binary

code that's standard for Win32 platforms. Their security model is also weaker than Java applets'. ActiveX controls support only code signing, rather than the three-prong approach supported by Java—virtual machine, security manager, and signing.

Java applets (especially when recast as JavaBeans) show more promise. Still, the number of sites using Java is surprisingly small, and many corporate sites refuse to allow downloaded Java applets to be run for fear of some as yet undiscovered security bug. In addition, Java is not the easiest language in the world for Web developers to learn, and a critical mass of JavaBeans has not yet appeared.

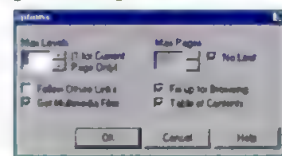
At the Professional Developers Conference in September 1997, Microsoft announced a new component model for Web development called *scriptlets*. Despite the less than original name, scriptlets are actually an extremely neat idea that deserves to be widely adopted. Scriptlets

INSIDE

POWER PROGRAMMING:

Automation servers—the ActiveX technology that gives your applications the ability to be scripted with VBA—are a lot easier to program with the assistance of MFC. But customizing your program requires intimate knowledge of MFC's internals. Here we show you how to limit your automation server to a single instance that can serve multiple clients. *Page 225.*

▼ **UTILITIES:** SiteSnagger downloads an entire Web site to your hard disk, letting you browse off-line. The site's pages and multimedia files are arranged in a tree display for easy navigation. *Page 229.*



PC SOLUTIONS: Shortcuts in your StartUp folder can give you faster access to all your drives; the best way to connect more than one printer to your PC; using expandable entry ranges in Excel as the source for a chart; getting a "search-as-you-type" entry field in Microsoft Access; and much more. *Page 233.*



build on the W3 Dynamic HTML object model and thus are as secure and potentially platform-independent as DHTML itself. (The full W3 Document Object Model is not yet supported by Netscape Communicator, but presumably such support is only a matter of time.) In this article, we'll show how you can use scriptlets in your Web development.

DYNAMIC HTML

Before you can work with scriptlets, you need to be familiar with the basics of DHTML. In a nutshell, what you need to know is that not only can objects (such as a document) be controlled through methods, but every tag on a Web page can be given an ID and controlled through a scripting language. For example, with the following code:

```
<P ID=TheText STYLE="color:black">
Click me and I'll become red text </P>
```

you can change the color of the text on the fly

IMPORTANT EVENTS FOR SCRIPTING

Event	When generated
OnMouseOver	Mouse pointer moves to the element.
OnMouseOut	Mouse pointer moves out of the element.
OnMouseDown	Mouse button is pressed inside the element.
OnMouseUp	Mouse button is released inside the element.
OnMouseMove	Mouse pointer moves inside the element.
OnClick	Left mouse button is clicked on the element.
OnDbClick	Left mouse button is double-clicked on the element.
OnKeyPress	Key is pressed and released. Holding a key down triggers multiple events.
OnKeyDown	Key is pressed. Triggers one event no matter how long the key is held down.
OnKeyUp	Key is released.

via an event procedure, such as:

```
Sub TheText_OnClick()
    TheText.style.color="red"
End Sub
```

The procedure will be triggered when a user clicks on that particular paragraph. (For all

the examples in this article, I use VBScript. You could also use JScript 3.0, Microsoft's version of JavaScript. JScript 3.0 is also intended to be a complete implementation of the European standard EcmaScript—basically an improved version of both JScript and JavaScript.)

The Document Object Model allows a browser to report 39 events to you for possible scripting. The table above shows the most important ones. Specific elements respond to different subsets of the events. DHTML events also can "bubble up" or be captured as they rise through a container. For example, you can process a click event in code associated with the ID of the paragraph where the mouse click has occurred or allow the event to bubble up to the document containing it for processing—or you can have code triggered in both places.

WHAT IS A SCRIPTLET?

It is hard to know how an idea sees the light of day, but clearly some folks at Microsoft had the insight that DHTML pages have at least at one level exactly the same features as Visual Basic controls, including:

- properties to describe how the pages look and feel;
- methods to control how they behave;
- events that the objects can be programmed to respond to.

From that point, it must have been no great leap to decide to build a reusable object technology by allowing DHTML pages to be treated as self-contained objects. Thus a scriptlet is a complete Web-ready HTML page that includes information that allows you to work with it as a control: You can get and set its properties, call its methods, and so on. More precisely, we might say that a scriptlet is a Web page based on DHTML that can be reused as a component with any application that supports such components.

SCRIPTLET PROS AND CONS

The advantages to using scriptlets are:

- It is much easier to learn DHTML and scripting than Java.
- DHTML pages can be reused.
- Scriptlets have excellent performance; they're as fast as DHTML.
- Scriptlets are lightweight, like any other

```
<HTML>
<HEAD>
<TITLE>Scriptlet Demo (animation)</TITLE>
<SCRIPT LANGUAGE = VBScript>
<!--
Dim AnimationSpeed
Sub public_put_AnimationSpeed(Speed)
    AnimationSpeed = Speed
End Sub

Sub public_Start(TheName)
    TheImage.Src=TheName
    TheTimer = Window.SetInterval("AnimateImage", AnimationSpeed)
End Sub

Sub public_Stop()
    TheTimer.ClearInterval
End Sub

Sub AnimateImage()
    If TheImage.Style.PixelLeft >= Document.Body.OffsetWidth Then
        TheImage.Style.PixelLeft = 0
    Else
        TheImage.Style.PixelLeft = TheImage.Style.PixelLeft + 10
    End If
End Sub
-->
</SCRIPT>
</HEAD>
<BODY>
<IMG ID = TheImage STYLE="position:relative;top:0;left:0" >
</BODY>
</HTML>
```



FIGURE 1: This scriptlet, written in VBScript, could be used to animate any .gif or JPEG as a "banner ad."

page, with minimal overhead.

- Scriptlets may eventually be truly cross-platform, with no virtual machine compatibility problems.

- Scriptlets are as secure as DHTML. Like Java applets, scriptlets must be loaded from the same Web servers as their container pages.

The disadvantages are:

- Scriptlets are not yet truly cross-platform. There is no guarantee that Netscape will adopt scriptlet technology. Microsoft's support, currently available only in Internet Explorer 4, depends on the company's Component Object Model (COM), which is not a cross-platform technology.

- A programmer working strictly in DHTML is limited, compared with what a skilled programmer can do in a full-fledged programming language such as Java. (But a DHTML programmer can do a lot; for example, you could build a "nervous text" scriptlet that works exactly like the famous Java applet of that name.)

- There is no way to keep a scriptlet's code hidden.

SCRIPTLET MECHANICS

Any DHTML page can be embedded as a scriptlet via a new MIME type that Microsoft

has submitted to W3. You use it in the `<OBJECT>` tag, as in the following prototype:

```
<object type="text/x-scriptlet"
  data="ScriptletUrl
  .html">
</object>
```

The scriptlet is named in the data parameter in the form of a standard URL. Notice that unlike ActiveX controls, there is no inscrutable CLASSID in the scriptlet object tag. As with any use of the `<OBJECT>` tag, you can also pass parameters to the scriptlet with tags like these:

```
<param name="ImageName"
  value=" PCMagLogo1.jpg">
<param name="Speed"
  value="100">
```

Like Visual Basic controls, scriptlets need to expose properties, methods, and events to the users of the component. When you build a scriptlet using VBScript, the

coding style is very close to the way you build an ActiveX control in VB5.

Let's start with methods. They are simply the functions or procedures that begin with a `public_` prefix. (Case, as with any VBScript code, is irrelevant.) For example, the signature for the following could give a public Start method to an animation scriptlet:

```
Sub public_Start()
  'code goes here
End Sub
```

Any functions or procedures not prefixed with `public_` are private to your scriptlet.

Properties use two prefixes in pairs: `public_get_` and `public_put_` (equivalent to VB5's Property Get/Let). If you leave out the corresponding `public_`

put to a `public_get`, you have a read-only property. For example:

```
Sub public_put_AnimationSpeed(Speed)
```

gives you a way to set an animation's speed property. (VBScript, unlike JavaScript, maintains a distinction between Sub routines, which don't return a value, and functions, which do.)

Following standard object-oriented programming principles, you can use private *instance fields* (data members) to encapsulate the property values. It is true that a variable with the `public_` prefix is the equivalent of a read/write property, but most programmers would discourage that formulation, preferring to permit access to private data fields only through explicit member functions.

Note that when you refer to a property or method of the scriptlet from a page that uses it, you do not include the prefix. For example:

```
Animation Scriptlet .AnimationSpeed =
Speed
```

is how your code using the scriptlet would look.

A SIMPLE ANIMATION SCRIPTLET

Let's build a scriptlet that can be used to animate an image file. The scriptlet needs two properties—one for the animation speed and one for the image's filename—and two methods—one to start the animation and one to stop it. Figure 1 shows how the VBScript code might look for this scriptlet.

The idea of the scriptlet is simple. By using

**Scriptlets
build on the
W3 Dynamic
HTML object
model and
thus are
as secure
as DHTML.**



```
<HTML>
<HEAD>
<TITLE>Using Scriptlets</Title>
<SCRIPT LANGUAGE = VBScript>
<!--
Dim Speed
Sub Window_OnLoad()
  AnimationScriptlet.Width = Document.Body.OffsetWidth
  Speed = InputBox("Please enter the animation speed in milliseconds or
  hit Enter for a default value of 1/10 of a second")
  If IsNumeric(Speed) Then
    Speed = Abs(Speed)
  Else
    Speed = 100
  End If
  AnimationScriptlet.AnimationSpeed = Speed
  AnimationScriptlet.Start("pcmaglog.jpg")
End Sub
-->
</SCRIPT>
</HEAD>
<BODY>
<h1>Here is a Scriptlet Animation</h1>
<OBJECT Height = 200 ID=AnimationScriptlet TYPE="text/x-scriptlet"
DATA="Script11.htm">
</OBJECT>
</BODY>
</HTML>
```



FIGURE 2: This Web page tests the animation scriptlet shown in Figure 1.

the `setInterval` method in DHTML, we can set up code that will be called periodically. The code we call moves the .jpg around the page, changing its position by resetting the `Left` property of the `<IMAGE>` tag. Note that the time interval for `setInterval` comes from the current value of the `AnimationSpeed` property and that the filename for the image is passed as a parameter to the `Start` procedure. When you use a scriptlet in a second page, its size is determined by the size parameters given inside the `<OBJECT>` tag, as you can see in the following section. Also note that the title of the displaying page comes from the first scriptlet used.

USING THE SCRIPTLET

Figure 2 shows a simple page that tests the scriptlet. We use an `InputBox` to ask for an animation speed. If a numeric value is entered, we use that; otherwise we make the default value 100, which means the image moves every tenth of a second.

The example scriptlet doesn't include any event-handling code. When you work with scriptlet events, you have to distinguish between two kinds: those that are handled completely inside the scriptlet's own code and those occurring in the scriptlet that you want to make the containing document aware of.

For example, you may want to have code in your document that is triggered when someone clicks inside the scriptlet. The page defining the scriptlet can certainly have code triggered by a `Click` event, but in this case you would want to pass the event to the page containing the scriptlet.

It turns out that you can have your scriptlets raise two kinds of events to the containing page: standard events in DHTML and custom events. To pass a standard event, you simply use

```
Window.external.bubble-
```

```
Event
```

in the scriptlet's corresponding event procedure. The event is reported to the containing page as the same standard DHTML event, so you can write code to handle it in exactly the same way you would if the event occurred on the page containing the scriptlet. Suppose, for example, you add this code to the page

that defines the scriptlet:

```
Sub Document_OnClick()  
    Window.external.bubbleEvent()  
End Sub
```

Then, when Internet Explorer detects a click inside the portion of the Web page that contains the scriptlet, it looks in the code for the `Document_OnClick` event handler inside the scriptlet and executes that code. As you can see, it finds a single line that tells it to "bubble," or report, the `OnClick` event to the external object containing the scriptlet.

Since the document that contains the scriptlet now knows about a click event, you can write the code in the containing page to respond to it. Unlike the code in the previous paragraph, this code will live in the page that *uses* the scriptlet. For example, this code on the containing page detects a click inside the scriptlet:

```
Sub AnimationScriptlet_OnClick()  
    MsgBox "You clicked inside the  
    Scriptlet"  
End Sub
```

```
<HTML>  
<HEAD>  
<SCRIPT LANGUAGE = VBScript>  
<!--  
Function public_get_TheValue()  
    public_get_theValue = TheNumber.Value  
End Function  
  
Function public_put_TheValue(n)  
    TheNumber.Value = n  
End Function  
  
Sub TheNumber_OnKeyPress()  
    Dim TheSource  
    Set TheSource = Window.Event  
    If TheSource.KeyCode < Asc(0) Or TheSource.KeyCode >  
    Asc(9) Then  
        Window.External.RaiseEvent "Bad keypress", window.event  
        Window.Event.ReturnValue = False  
    End If  
End Sub  
-->  
</SCRIPT>  
</HEAD>  
<BODY>  
<Input Type="Text" ID = TheNumber STYLE="position:relative;  
top:0;left:0">  
</BODY>  
</HTML>
```

FIGURE 3: This sample scriptlet produces a text box that can accept only numerals (0-9). The scriptlet raises a "bad keypress" event if a user tries to enter anything else.

DEFINING CUSTOM EVENTS

Events that you pass on using `Window.external.bubbleEvent` are limited to the 39 DHTML events. But sometimes you need to tell your container something has happened that is *not* one of the standard events. For example, a text-box scriptlet for data entry might want to tell its container that there was a bad entry by sending out a custom `BadEntry` event.

Luckily, the scriptlet specification allows you to do more than bubble standard events up through the containing hierarchy. You can also define custom events. The form that usually takes is a line of code like:

```
window.external.raiseEvent(eventName,  
anObject)
```

where `EventName` is a string that names the event and `anObject` can be any script object (but is usually `Window.Event`).

You can raise an `OnScriptletEvent` at any time in the scriptlet's code. This in turn triggers the `OnScriptletEvent` in the container. Usually the event handler for the `OnScriptletEvent` in the containing page analyzes the string to decide what to do in response to the event.

For example, suppose we want to build a scriptlet with a text box that can accept only numerals and raise a bad-keypress event if a user tries to enter non-numeric data into the text box. We would do that by placing code in the `OnKeyPress` event handler for the text box contained in the scriptlet, so that the text box would reject all nonnumeric keystrokes and the required custom event would be raised in response to a bad keystroke.

The key to successfully coding this scriptlet would be to have the equivalent of the following lines of code in the event:

```
If Window.Event.KeyCode <  
Asc("0") Or  
Window.Event.KeyCode >  
Asc("9") Then  
    Window.External.RaiseEvent  
    "Bad keypress",  
    Window.Event  
    Window.Event.ReturnValue  
    = False  
End If
```


Notice how the code uses the string parameter that every custom event must have in order to tell what event has happened. For example, imagine we had another event for this scriptlet called "Bad paste action," which gets triggered when a user pastes an illegal entry. We would have to analyze the string to see if it was "Bad keypress" or "Bad paste action." Notice that we are treating

```
Window.External.  
RaiseEvent
```

as a Sub procedure, which in VBScript doesn't require parentheses around its parameters. The next line sets the ReturnValue property of the Window.Event object to False in order to cancel the keystroke. (This is not very well documented in Microsoft's Internet Client SDK, but setting ReturnValue to False does what is needed to kill the keystroke.)

To turn this scriptlet into a full-fledged "Integer Text Box" requires adding the messy code to allow only a single minus sign as the first character and to handle a user trying to paste bad entries into the box. In the code for our simple example, we don't deal with these complexities.

Next, let's assume you give the scriptlet a catchy ID property like IntegerBoxScriptlet. Then the VBScript code for the HTML page that contains the scriptlet can detect which event happened like this:

```
Sub IntegerBoxScriptlet  
_OnScriptletEvent(TheString, o)  
If TheString = "Bad keypress" Then  
MsgBox "Bad key pressed, please  
enter only numerals (0-9), please!"  
End If  
End Sub
```

You have to be careful to have exactly the right string value (including case) on the right-hand side of the test above. Using

```
If TheString = "bad keypress" Then
```

would fail.

Figure 3 shows the full source code for the scriptlet (notice that it has a read/write property called TheValue to let us get and set the value stored in the text box).

Figure 4 shows a little HTML page that you

DHTML pages have at least at one level exactly the same features as Visual Basic controls.



can use to test the code. When you click in the second text box, it automatically displays the value you entered in the text box of the scriptlet.

CONTEXT MENUS FOR SCRIPTLETS

In Internet Explorer, a scriptlet can have a context menu that will pop up whenever a user right-clicks inside it. To create a context menu, you need an array of strings, which have to come in pairs. The first string of each pair is the menu item, and the second is the name of the function to call inside the scriptlet when a user selects it. When you have initialized the array, you need to call the function

```
Window.External.SetContextMenu
```

with the array as its only parameter. The

next time a user right-clicks over your component, the context menu will appear. Here's an example of creating a context menu in the OnLoad event for our animation scriptlet:

```
Sub Window_OnLoad  
Dim MenuItems(3)  
MenuItems(0) = "Start the animation"  
MenuItems(1) = "Start"  
MenuItems(2) = "Stop the animation"  
MenuItems(3) = "Stop"  
Window.External .SetContextMenu  
(MenuItems)  
End Sub
```

Although you can define a custom event to notify the host that something other than one of the standard DHTML events occurred, you can also define a custom event to pass more detail about a standard event (for example, which button has been clicked) or to notify the host about changes in the scriptlet itself (for example, when a property changes).

JAVASCRIPT DIFFERENCES

Although using VBScript to build scriptlets should certainly be more comfortable to the millions of VB programmers out there, JScript has one advantage: You can use a public_description object to describe the public interface of the scriptlet. If you define a public_description object, then its members become the properties and methods exposed to the outside world. You don't need to use the public_ prefix, and if you do have any global variables or functions with the prefix, they are ignored. Otherwise, writing a scriptlet using JScript is exactly the same as in VBScript. 

Gary Cornell teaches at the University of Connecticut and has written or cowritten more than 20 computer books. His latest, *Learn VBScript Now*, was recently published by Microsoft Press.

```
<HTML>  
<HEAD>  
<TITLE>Using A Custom Event Handler in a  
Scriptlet</Title>  
<SCRIPT LANGUAGE = VBScript>  
<!--  
Sub Window_OnLoad()  
IntegerBoxScriptlet.Width = Document.Body.  
OffsetWidth  
End Sub  
  
Sub IntegerBoxScriptlet_OnScriptletEvent(TheString, o)  
If TheString = "Bad keypress" Then  
MsgBox "Bad key presses, only numerals (0-9),  
please!"  
End If  
End Sub  
  
Sub CurrentValue_OnClick()  
CurrentValue.Value = IntegerBoxScriptlet.TheValue  
End Sub  
</SCRIPT>  
</HEAD>  
<BODY>  
<OBJECT Height = 200 ID=IntegerBoxScriptlet  
TYPE="text/x-Scriptlet" DATA="Script12.htm">  
</OBJECT>  
<BR>  
<INPUT TYPE = "Text" ID = CurrentValue>  
</BODY>
```



FIGURE 4: An HTML page that you can use to test the code in Figure 3.

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Single-Instance Automation Servers and MFC

A little know-how and a few lines of code can transform any MFC Automation server into a one-instance wonder.

By Jeff Prorise

One of the single most important reasons for C++ programmers to learn Microsoft Foundation Classes (MFC) today is to simplify the process of writing Automation servers. Automation is the ActiveX technology that allows Excel and other Office applications to be scripted with Visual Basic for Applications (VBA). It is also the secret ingredient that permits scripts written in VBScript and other languages to drive ActiveX controls embedded in Web pages. The popularity of scripting is growing every day, and in the not-too-distant future, applications that lack Automation support will probably be regarded the way 16-bit applications are today.

Automation servers are complex creatures, but combined with the code-generating powers of the Visual C++ wizards, MFC makes writing them a joy. Just check the *Automation* box in AppWizard, add properties and methods with ClassWizard, type in a little code, and before you know it, you have an Automation server.

The downside to writing Automation servers with MFC is that when you rely on a class library to provide huge chunks of a program's functionality, making minor changes to the program's behavior may require intimate knowledge of the class library's internals. A case in point is the *singleton* Automation server. By default, an Automation server built with MFC creates a new Automation object at each client's request. This means that if ten different Visual

Basic (VB) clients call `CreateObject`, the object identified in the call will be instantiated in memory ten times. Sometimes that's exactly what you want, but on other occasions it's preferable to limit the Automation object to a single instance, in which case the object is called a singleton. If the object stores no per-client state information, a singleton Automation object can serve multiple clients more efficiently—with less overhead—than a multiple-instance version of the same.

How can you tweak MFC to build a single-instance Automation server? The question is more than theoretical, because when I teach classes on Automation servers, it's the number-one question that developers ask. It seems that a lot of Automation programmers want their clients to be able to connect to a single Automation object. And they want it to work not just for Automation servers that run on the same machines as their clients, but also for servers that run on remote network servers.

In this article, I'll outline the steps necessary to create single-instance Automation servers with MFC. In addition to learning a cool new programming technique, you'll get a working education in how MFC implements COM class factories.

MFC, COM, AND CLASS FACTORIES

As a first attempt to create singleton Automation servers, many MFC programmers look to the `bMultiInstance` parameter passed to the `COleTemplateServer::ConnectTemplate`

function. The MFC documentation describes this parameter as follows:

Indicates whether a single instance of the application can support multiple instantiations. If TRUE, multiple instances of the application are launched for each request to create an object.

When you use AppWizard to create the initial code for a doc/view Automation server, it adds the following call to the application object's `InitInstance` function:

```
m_server.ConnectTemplate(clsid,
    pDocTemplate, TRUE);
```

Passing TRUE for the third parameter tells MFC to launch a new instance of the server process each time a client calls `CreateObject` or an equivalent. Therefore, it's tempting to try to create a singleton Automation server by changing TRUE to FALSE, like this:

```
m_server.ConnectTemplate(clsid,
    pDocTemplate, FALSE);
```

The only problem is that this doesn't quite do the trick. Yes, COM will now start just one instance of the server process no matter how many clients there are. But that server will still create multiple instances of the Automation object. A singleton Automation server limits the number of *objects* to one—not just the number of server processes.

The next option that many MFC programmers investigate involves changing the way in which the client connects to the server. A typical MFC Automation client launches a server and connects to it by calling `CreateDispatch` on the `COleDispatchDriver`-derived class that represents the Automation object:

```
if (SUCCEEDED (::CLSIDFromProgID
    (OLESTR ("Foo.Application"),
    &clsid)))
    m_server.CreateDispatch
    (clsid);
```

Calling `CreateDispatch` ten times creates ten separate instances of the Automation object. However, `COleDispatchDriver` also provides an `AttachDispatch` function that connects to a running instance of an Automation server without launching a new one. Code that first attempts to attach to a running server and then launches a new instance if and only if the server isn't already running is shown in Figure 1.

This code works, but it's subject to a couple of limitations. First, the call to `::GetActiveObject` will only find a running Automation

```
if (SUCCEEDED (::CLSIDFromProgID (OLESTR ("Foo.Application"), &clsid))) {
    if (SUCCEEDED (::GetActiveObject (clsid, NULL, &pUnknown))) {
        HRESULT hr = pUnknown->QueryInterface (IID_IDispatch,
            (LPVOID*) &pDispatch);
        pUnknown->Release ();
        if (SUCCEEDED (hr))
            m_server.AttachDispatch (pDispatch, TRUE);
    }
    if (m_server.m_lpDispatch == NULL)
        m_server.CreateDispatch (clsid);
}
```



FIGURE 1: This MFC code attempts to connect to a running instance of an Automation server before calling `CreateDispatch` to create a new one.


```
#define DECLARE_OLECREATE_CUSTOM(class_name, classfactory_name) \
public: \
static AFX_DATA classfactory_name factory; \
static AFX_DATA const GUID guid; \
\
#define IMPLEMENT_OLECREATE_CUSTOM(class_name, classfactory_name, \
external_name, l, w1, w2, b1, b2, b3, b4, b5, b6, b7, b8) \
AFX_DATADEF classfactory_name class_name::factory(class_name::guid, \
RUNTIME_CLASS(class_name), FALSE, _T(external_name)); \
const AFX_DATADEF GUID class_name::guid = \
{ l, w1, w2, { b1, b2, b3, b4, b5, b6, b7, b8 } }; \
```

FIGURE 2: *DECLARE_OLECREATE_CUSTOM* and *IMPLEMENT_OLECREATE_CUSTOM* work just like MFC's *DECLARE_OLECREATE* and *IMPLEMENT_OLECREATE* macros, but they accept an additional parameter allowing the programmer to specify the name of the class-factory class.

server if that server has called `::RegisterActiveObject` to register itself in the Running Object Table (ROT). MFC Automation servers don't call this function by default, so it's up to you to write the code. The code itself is no big deal, but once you add it, you'll discover the second limitation: The ROT is machine-local. The `::GetActiveObject/AttachDispatch` method works just fine for clients and servers running on the same machine, but if the server is running elsewhere on the network, then `::GetActiveObject` will fail to find it.

Clearly, there must be a better way. The best solution is one that is transparent to clients—that is, one that's implemented entirely on the server side so clients don't have to do anything special to connect to the same Automation object over and over again. That solution should also work on a local machine or across a network.

The key is the Automation server's *class factory*. In COM, every externally creatable class—that is, any class that can be instantiated with a CLSID or ProgID—is accompanied by a special object known as a class factory. Ultimately, it's the class factory that decides how many instances of an object are created. MFC class factories, which are actually instances of MFC's `CObjectFactory` class, create a new object each time their `CreateInstance` function is called. One way to create an MFC Automation server that creates just one Automation object that can be shared by multiple clients is to modify `CObjectFactory` so that it creates an object the first time `CreateInstance` is called and passes out pointers to the existing object's `IDispatch` interface in subsequent calls.

Modifying `CObjectFactory` is the easy part. Just derive a class from it and override `OnCreateObject` in the derived class. When a

client calls an MFC class factory's `IClassFactory::CreateInstance` function, `CObjectFactory::OnCreateObject` is called. `OnCreateObject` is virtual, so you can safely override it in a derived class. Here's how the overridden function should be implemented:

```
CComTarget* CMyClassFactory::\
OnCreateObject ()\
{\
    if (m_pObject != NULL) {\
        m_pObject->GetIDispatch\
            (FALSE)->AddRef ();\
        return m_pObject;\
    }\
    return\
        CObjectFactory::\
            OnCreateObject ();\
}
```

Note that `m_pObject` is a `CComTarget` pointer that's initialized to `NULL` in the class factory's constructor. Implemented this way, the class factory will create an object the first time it's called and pass out the object's address in subsequent calls. You needn't worry about the object being deleted and `m_pObject` being left holding an invalid address, because when the object is deleted, the server terminates and the class factory is deleted, too.

The more difficult task is getting MFC to use the derived class factory instead of `CObjectFactory`. Class factories are normally added to an MFC Automation server by including the `DECLARE_`

`OLECREATE` and `IMPLEMENT_OLECREATE` macros in the server's source code. Unfortunately, these macros are hardwired to declare a static instance of `CObjectFactory`. Since neither macro allows the programmer to specify the class factory's class name, you must create your own `OLECREATE` macros that do. Then you can derive a class from `CObjectFactory`, substitute the customized `OLECREATE` macros for the conventional ones, and include the name of the derived class in the macros' argument lists. Figure 2 contains the new `OLECREATE` macros' source code listings.

With that, all the pieces are in place. First you create a singleton class factory by deriving from `CObjectFactory` and overriding `OnCreateObject`. Then you declare an object of the derived class using modified versions of MFC's `DECLARE_OLECREATE` and `IMPLEMENT_OLECREATE` macros. Now, if ten different VB clients call `CreateObject` (or ten MFC Automation clients call `CreateDispatch`), they'll all attach to the same Automation object. The sample programs in the next section demonstrate how.

TIMESERVER AND TIMECLIENT

The `TimeServer` and `TimeClient` applications pictured in Figure 3 are dialog-based MFC applications written and compiled with Visual C++ 5.0. `TimeServer` is an Automation server that limits the Automation object it creates to a single instance. The object has just one Automation method, `GetTime`, which a client can call to retrieve the current time of day. `TimeClient` is an Automation client that uses MFC's `CreateDispatch` function to connect to `TimeServer`. Clicking `TimeClient`'s `Get Time` button calls the server's `GetTime` function and displays the current time. Because `TimeServer` is a singleton Automation server, the first call to `CreateDispatch` starts the server and creates

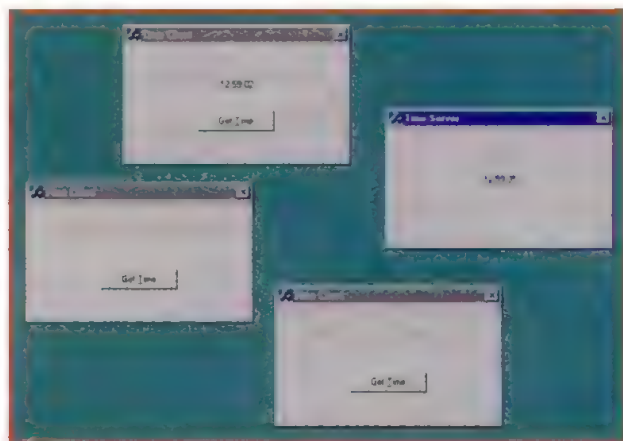


FIGURE 3: Because *TimeServer* is a singleton Automation server, a single object can be shared by all *TimeClient* instances.

the Automation object. Subsequent calls to `CreateDispatch` attach the caller to the object created the first time `CreateDispatch` was called. You can download both programs, complete with source code, from PC Magazine Online. See the sidebar "Getting the Files" in the Utilities column for instructions.

Scan `TimeServer`'s source code and you'll see the how the singleton class factory is implemented. `TimeServer`'s class factory comes from the `COleObjectFactory`-derived class named `COleSingleObjectFactory`, which overrides the former's `OnCreateObject` function and replaces it with one just like the one shown in the previous section. The Automation object that the class factory creates is an instance of the `CTimeServerDlgAutoProxy` class. This class uses the `OLECREATE` macros in

The best solution is
one that is transparent
to clients and entirely
on the server.

Figure 2 to declare `CSingleObjectFactory` as the class factory of choice.

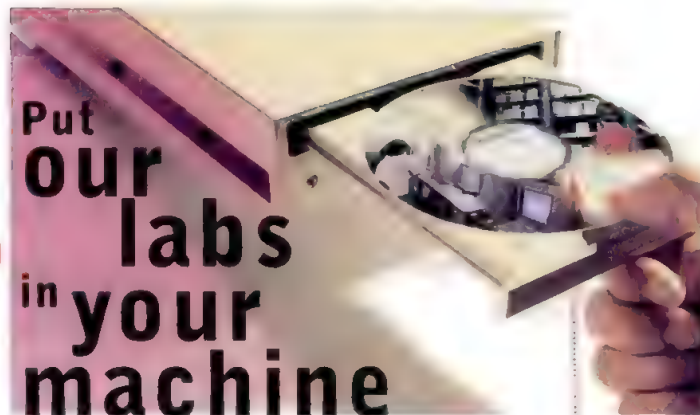
You can try out these applications for yourself by starting two or more instances of `TimeClient`. When the first instance is started, `TimeServer` will automatically start too. Starting a second instance of `TimeClient` will cause another `TimeClient` window to appear on the screen, but not another `TimeServer` window. Each additional instance of `TimeClient` will reuse the Automation object created by the first instance. Moreover, this behavior isn't dependent on the assumption that `TimeServer` and `TimeClient` are running on the same machine. If your network is DCOM-enabled, you can verify this by installing `TimeServer` on a network server and running two or more instances of `TimeClient` on different network workstations.

As you can see, creating a single-instance Automation server like `TimeServer` isn't difficult—once you know how. The biggest obstacle for most programmers is figuring out where and how to patch MFC. Now that the secret's out, you can quickly and easily transform just about any MFC Automation server into a one-instance wonder. **PC**

Jeff Prosise is a contributing editor of PC Magazine and gives lectures around the country on programming Windows with C++ and MFC.

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DO YOU YAHOO!?

Download Web Sites

Avoid waiting for individual Web pages to load: SiteSnagger downloads entire Web sites.

By Steven E. Sipe

Searching through the wealth of information available on the World Wide Web can be very time-consuming. Today, it's not uncommon for a Web site to contain hundreds or even thousands of pages. Further complicating matters, you can experience significant delays while accessing a Web site. These delays are caused by many factors, such as the number of users currently using your Internet service provider (ISP) and the number of users accessing the Web site.

Another problem is that Web pages are only temporarily downloaded to your PC while you're browsing. You can't retrieve several pages of information and view them later when you're no longer connected to your ISP. Perhaps you've wished there were a way to download pages from your favorite Web site and view them at a later time. For instance, it might be convenient to download pages from a Web site to your laptop so you can browse them during a plane flight. Or you might want to download a site late in the evening, when Internet traffic is lighter, and view that information the next day at a more convenient hour.

If you've experienced any of these problems, then this issue's utility, SiteSnagger, might be just what you're looking for. SiteSnagger lets you download the contents of a Web site to your PC's hard disk. You can download as much or as little of the site as you wish, and you can browse the information anytime and anywhere. SiteSnagger organizes the site information in a tree display of the pages and multimedia files that you've snagged. In addition, a Table of Contents page provides links to each of the pages you've downloaded, so you can quickly jump to any of them. SiteSnagger requires Windows 95 or Windows NT 4.0 and an Internet connection.

RUNNING SITESNAGGER

To install SiteSnagger, copy its three program files (SiteSnag.exe, SiteSnag.cnt, and SiteSnag.hlp) to a subdirectory on your hard disk. SiteSnagger's main window holds the tree display of the site you have snagged (see Figure 1). A panel below the tree and just above the status bar displays statistical information as you snag a Web site.

To begin working with SiteSnagger, create a new project or open a previously saved one. When you select *Project | New* to create a new project, SiteSnagger displays a dialog box for entering the project's name. The project name can be up to 20 characters and may contain any combination of alphabetic and numeric

SiteSnagger

SiteSnagger lets you download the contents of a Web site to your PC's hard disk, organizing the site information in a tree display of the pages and multimedia files that you've snagged.



characters, as well as the space character. When you press *OK*, SiteSnagger creates a new project information file using the name that you specified and an .SNG extension. This project file stores your project options as well as specific information about the pages snagged from a Web site.

Project files are stored in a subdirectory called "Projects," which is automatically created under the directory that holds the SiteSnagger program. SiteSnagger also creates a

new subdirectory under the Projects subdirectory with the same name as your new project. This new subdirectory will hold all of the HTML pages and multimedia files that you snag from a Web site.

SITESNAGGER'S OPTIONS

Once you've created or opened a project, you can customize how SiteSnagger snags the Web site. To configure the project's options, choose *Options* from the Project menu (see Figure 2). The *Max Levels* setting lets you specify how many levels of linked pages SiteSnagger should download. If you set *Max Levels* to 1, SiteSnagger will download only the page you specify and none of its links. If you specify 2, you'll get the page you specify plus all pages that have links on that page. You can tell SiteSnagger to download up to 20 levels, but be careful not to set *Max Levels* too high, especially if you're planning to snag a large Web site. If you set *Max Levels* to 3 and snagged *PC Magazine's* Web site, for example, you would download over 1,000 files.

The *Max Pages* option lets you control the maximum number of HTML pages downloaded. When SiteSnagger's downloaded page count reaches this maximum, it stops the snagging operation immediately. (Note that the *Max Pages* setting will override the *Max Levels* setting.) Once the maximum number of pages has been downloaded, SiteSnagger will stop downloading, even if it hasn't yet drilled down to the *Max Levels* setting. If you don't want to limit the number of pages, you can check the *No Limit* check box; SiteSnagger will use the *Max Levels* setting to limit the download.

Many Web sites contain links that point to Web sites in different domains—for example, links to advertiser pages or the latest version of your favorite browser. In most cases, you won't want to follow links to another server, but SiteSnagger lets you control this behavior in case you do. If you check the *Follow Offsite Links* option, SiteSnagger will download the initial page from an off-site server. Note that SiteSnagger only gets the *first* page from an off-site link, regardless of the *Max Levels* setting. Of course, you can always create

FOR PROGRAMMERS ONLY SiteSnagger is a 32-bit Windows application written in C++ with MFC (Microsoft Foundation Classes). It can be compiled with Microsoft Visual C++ 5.0. SiteSnagger's full source code is available on *PC Magazine's* Web site (www.pcmag.com) and demonstrates the following programming techniques:

- using the Win32 Wininet Internet communications routines;
- recognizing and extracting HTML tags from Web pages;
- navigating through various levels of linked pages.

SUPPORT Help for *PC Magazine's* free utilities can be obtained in our online discussion areas, both on the World Wide Web (www.pcmag.com/discuss.htm) and on ZDNet in the Utilities section of ZDNet's TIPS Forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum daily. You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

[WWW.PCMAG.COM](http://www.pcmag.com)

another SiteSnagger project to snag the other Web site pages.

The *Get Multimedia Files* option tells SiteSnagger whether to download any associated multimedia files it encounters on a particular Web page. When this option is checked, SiteSnagger downloads the various multimedia files that a particular page requires. Downloading multimedia files improves the appearance of the page in your browser, and it may even be necessary for sites that make extensive use of image maps, but it can dramati-

for the base address of the site you want to download. For instance, to snag *PC Magazine's* Web site, you would enter *http://www.pcmag.com*.

The *Snag a site* screen displays your main project options in the lower part of the screen as a helpful reminder. If you need to change your options, click *Cancel* and bring up the Options dialog. Otherwise, once you've entered the base address, you can press the *Start* button to start snagging. The statistics area at the bottom of the main window displays how many text pages SiteSnagger is currently planning to download ("Queued"), the number of HTML pages already downloaded ("Pages"), the total number of files downloaded ("Tot Files"), and the total size of downloaded files in kilobytes ("Tot Size").

Most of SiteSnagger's menu options aren't available while snagging is in progress. For instance, you can't change project options or open a new project. One option is enabled only during snagging: the *Stop* button on the toolbar. Pressing *Stop* tells SiteSnagger to stop the download process *after* the current page is finished. It can take several seconds before the current page is finished, so SiteSnagger may not appear to respond immediately.

When the current page is finished, SiteSnagger will ask you whether you still want to fix up the pages for browsing (if you have *Fix up for Browsing* checked).

Note that snagged files are always saved along with the project file, even if you interrupt the download. If you no longer want a project and its associated files on your hard disk, select *Delete* from the Project menu, or click the *Delete* button on the toolbar.

As SiteSnagger downloads a site, it fills a tree in the main window with the name of each of the downloaded pages, along with each of the downloaded multimedia files. It also creates a Table of Contents. You can view any of the files in the tree by double-clicking on the file's name. This causes Windows to load the program associated with the specified file type. For example, clicking on a snagged .HTM page causes Windows to load your browser and display that page.

SiteSnagger's Table of Contents is an HTML page with links to every page downloaded. The list is identical to the list that you see under the Pages node of the tree, but since it is an HTML file, you can use the *Back* button to return to it after viewing each downloaded page. This lets you browse

through the pages more quickly.

If you decide you don't like the name you chose for a project, you can rename it by choosing *Rename* from the Project menu. This renames the current project's .SNG file as well as the subdirectory where any downloaded files are stored.

When you've finished viewing snagged files, you can exit SiteSnagger by choosing *Exit* from the Project menu. The active project is automatically saved when you exit. If you want to open this saved project the next time you run SiteSnagger, select *Open* from the Project menu.

For diagnostic purposes, SiteSnagger generates a log of every file it downloads and of the level at which it encountered each item. The log file, called *Sitesnag.log*, is stored in the subdirectory of each new project. The log is a standard text file that you can view using a text editor such as Notepad.

Note that SiteSnagger is a resource-intensive utility. Some basic page information must be saved in memory, so if you're downloading a site with several thousand files, SiteSnagger will require at least 2MB of free memory. Hard disk requirements can also be heavy, since downloaded pages and multimedia files can consume a large amount of disk space. SiteSnagger's status window shows the total size of all files currently downloaded so that you can see the amount of disk space the downloaded files have consumed so far.

Also note that there are certain types of Web sites that SiteSnagger is unable to download. Some servers require you to enter a user ID and password before you can access their contents. SiteSnagger doesn't provide a way to enter this information, so you can't access these Web sites. And while you can download CGI and Java scripts, they will not run properly on your local machine if they require resources on the server. Also, you can't follow links that

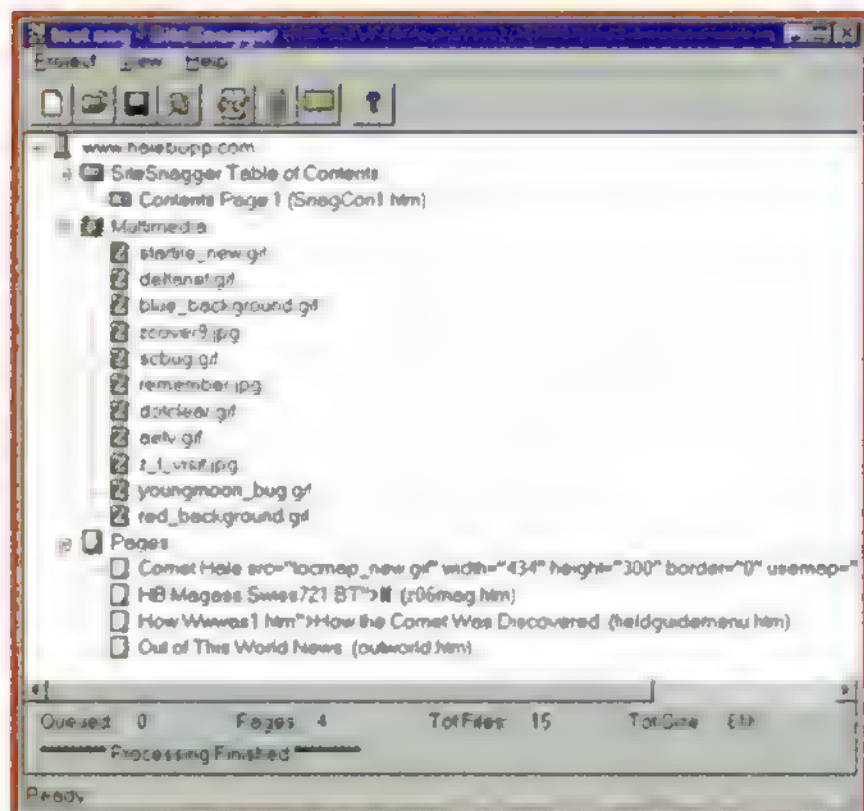


FIGURE 1: SiteSnagger's main window holds the tree display of the site you have snagged. A panel below the tree displays statistical information.

cally increase the amount of time required to snag a Web site. If your only interest in a Web site is its textual content, you can save a lot of download time by leaving this option unchecked.

To view a Web site from your local hard disk, you must tell SiteSnagger to fix up the HTML so that all of each page's references to images and other pages refer to local copies of these files, rather than copies on the server. If the *Fix up for Browsing* option isn't checked, you won't be able to browse a site from your hard disk and you'll have to snag the site again with the option checked. There are some cases where you'll want to keep the pages in their original conditions and leave this option unchecked. For example, you may want to archive the pages or transfer them to another server.

SNAGGING A WEB SITE

Once you've configured your project's options, then you're ready to begin snagging a Web site. You can start snagging by choosing the *Snag a site* option from the Projects menu or by pressing the *Snag* button on the toolbar. SiteSnagger will respond by prompting you

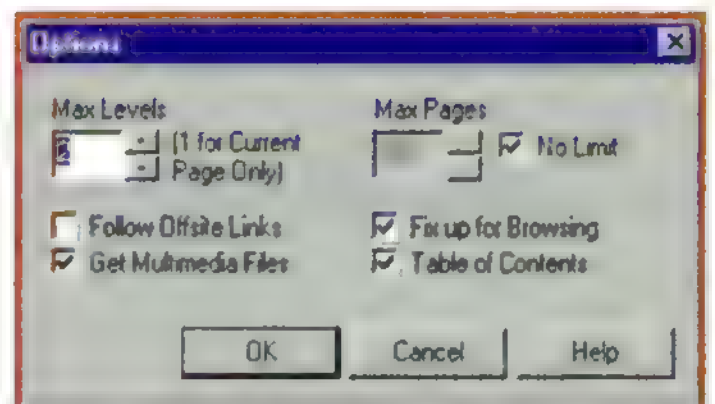


FIGURE 2: This dialog lets you specify what options to use when downloading the current project.

rely on Java or CGI program logic.

Although SiteSnagger does not in itself include scheduling capability, it provides command line equivalents for its options, so

PCTech Utilities

you can use it with scheduling utilities such as System Agent (which comes with the Windows 95 Plus! pack). The command line syntax for SiteSnagger is as follows:

```
sitesnag projectname URL [/lx] [/px]  
[/o+|/o-] [/m+|/m-] [/b+|/b-] [/c+|/c-]
```

where the switches have the following meanings:

/lx	Maximum number of levels
/px	Maximum number of pages
/p0	No limit on number of pages
/o+	Follow off-site links
/o-	Don't follow off-site links
/m+	Get multimedia files
/m-	Don't get multimedia files
/b+	Fix up files for browsing
/b-	Don't fix up files for browsing
/c+	Create a Table of Contents
/c-	Don't create a Table of Contents

If you leave out an option, the default setting for that option will be used. The default option settings are

```
sitesnag projectname URL /l2 /p0 /o-/m+  
/b+ /c+
```

INSIDE SITESNAGGER

SiteSnagger is a 32-bit Windows application written in C++ with MFC. It can be compiled with Microsoft Visual C++ 5.0. SiteSnagger's source code demonstrates several interesting programming techniques, including how to use the Win32 WinInet Internet communications routines, how to recognize and extract HTML tags from Web pages, and how to navigate through various levels of linked pages.

SiteSnagger communicates with a Web site's server using the WinInet calls built into Win32. The WinInet calls consist of various Internetxxx() functions that allow you to retrieve files, send requests to the server, and so forth. Before using the WinInet calls, you must establish a session using the InternetOpen() call. InternetOpen() returns a session handle that you must use in any subsequent WinInet calls. Once you've established a session, you can call InternetOpenURL() to open a particular URL. InternetOpenURL() can open FTP, Gopher, or HTTP URLs, but SiteSnagger only deals with HTTP URLs. If InternetOpenURL() is successful, then you can call InternetReadFile() to retrieve the data for the specified page. When you've finished using the WinInet calls, you must call

InternetCloseHandle() with the session handle returned from InternetOpen().

The WinInet calls that SiteSnagger uses are synchronous. In other words, the program's execution is suspended while these calls are performed. Unfortunately, suspending execution in this manner can have a very bad effect on the painting of your program's user interface. If your application doesn't respond to a WM_PAINT message in a reasonable amount of time, then its main window becomes nothing more than a blank rectangle. To avoid this scenario, SiteSnagger uses the AfxBeginThread() call to create a separate thread for WinInet communications. This separate thread allows SiteSnagger's user interface to be responsive at all times, even during lengthy downloads. It also allows SiteSnagger's main window to be painted properly.

EXTRACTING HTML TAGS

The information presented on a Web page is formatted using various HTML tags. These tags specify such things as a page's background image and links to other pages. To navigate through a particular Web site, SiteSnagger must read each page's HTML to determine if there are references to multimedia files or linked pages. SiteSnagger's CHtml-

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Parser class implements a simple HTML parser that takes as input a buffer containing a Web page. It iterates through each of the page's HTML tags and provides information about the tags' associated parameters.

SiteSnagger's CHtmlParser class is designed to retrieve information for any type of HTML tag, but in reality SiteSnagger is only interested in the handful of HTML tags that refer to page links or multimedia files. The CHtmlParser::WantTag() virtual method allows the parser to remain flexible enough to process any tag, but it also provides efficiency by allowing a derived class the opportunity to tell the parser to ignore certain tags. The CSnaggerHtmlParser derived class provides a derived version of WantTag() that processes only the specific HTML tags that are of interest to SiteSnagger.

NAVIGATING LINKS

The WinInet routines make downloading a page of HTML text a snap. SiteSnagger's parsing routines make it simple to dissect a downloaded page and extract tags for multimedia files and linked pages. Unfortunately, snagging a Web site involves a bit more work than just capturing one page of text along with its associated multimedia files. A typical Web page contains links to many other Web pages, which in turn may point to still more Web pages. To drill down through the levels properly, SiteSnagger uses an approach very similar to (but not quite the same as) one you might use to list all of the files and directories on your hard disk.

SiteSnagger's RecursiveDownload() method starts a thread that handles the navigation and downloading of linked Web pages. This recursive routine stores links in a stack, which is structured as a two-dimensional array (see Figure 3). The first dimension of the array holds the "stack level," or the level to which

you must drill down for the page (this corresponds to the *Max Levels* setting in the Options dialog), and the second dimension holds the name of the linked page.

SiteSnagger drills down through the linked Web pages and adds entries to its stack of links as it encounters each new level. For example, let's say you have *Max Levels* set to *three*. SiteSnagger first downloads to disk the initial Web page specified in the "Snag a site" dialog. It then saves the links on the downloaded page in `m_aLinks[0]`. Next, it downloads the page referenced in `m_aLinks[0].arrLinks[0]`—the first link on the initial

```
// Definition of a link stack entry
typedef struct
{
    CStringArray arrLinks;
    // address of linked pages
    CStringArray arrMedia;
    // address of linked multimedia files
    int nIndex;
    // maximum level of depth reached
} LINKS;

// The link stack
LINKS m_aLinks[20];
```

FIGURE 3: SiteSnagger stores links and their levels in the stack, in a two-dimensional array.

downloaded page. This new page's links are then saved in `m_aLinks[1]`. Finally, SiteSnagger downloads the page referenced in `m_aLinks[1].arrLinks[0]`.

At this point, we've reached the maximum number of levels specified (three), so the next step is for SiteSnagger to retrieve the page referenced in `m_aLinks[1].arrLinks[1]`. It then proceeds through each of the entries in `m_aLinks[1].arrLinks[x]` until it has downloaded every page. Finally, it moves back to

`m_aLinks[0].arrLinks[1]` and starts the same process again with a new page.

There is an important difference between recursively navigating links and recursively navigating hard disk directories. Unlike hard disk directories, Web pages are not organized in a hierarchy of parent and child pages. Let's say Web page A links to Web page B. In a true hierarchy, Web page B could not link back to Web page A, but in fact such a page often does. If SiteSnagger didn't detect these types of circular links, it would waste a lot of time trying to follow them until *Max Levels* was reached. To solve this problem, SiteSnagger keeps track of the lowest level at which it has encountered a particular page. When SiteSnagger prepares to follow the links on a new page, it first compares the current level of processing with the record of the lowest level on which it has found the page. If the current level is not lower than that level, then SiteSnagger knows that it doesn't need to follow the page's links again, because they've already been followed at a lower level.

So the next time you're on a long plane flight and you wish there were a way to browse your favorite Web site, or the next time you're moving slowly through an over-crowded Web site, think about giving SiteSnagger a try. It doesn't miraculously give you a remote connection to your ISP or bring a slow Web site up to speed, but it does automate the time-consuming job of retrieving Web pages. SiteSnagger saves you time by giving you the ability to view a Web site at any time or any place you choose. **PC**

Steven E. Sipe, the author of SiteSnagger, is a developer based in Wilmington, North Carolina. Sheryl Canter is the editor of the Utilities column and a contributing editor of PC Magazine.

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User-to-User

BY NEIL J. RUBENKING

Faster Access to All Drives

An easy way to have fast access to all your drives, without having to open Explorer, is to make shortcuts to them in your Start folder. You can do this by right-clicking on Start and choosing Open | File | New | Folder. Call the new folder "Drives." Double-click on the new Drives folder to open it, and create shortcuts to all the logical drives you want easy access to.

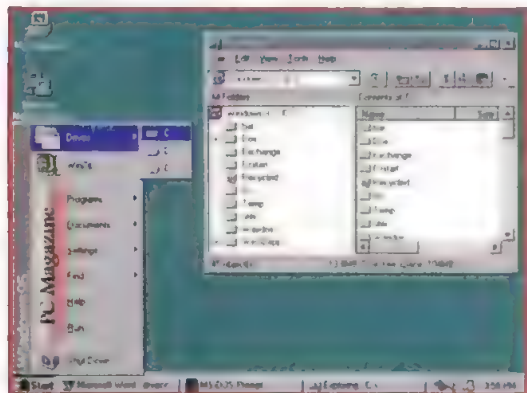


FIGURE 1: By adjusting the target string of a drive-access menu item, you can cause it to launch a "rooted" Explorer view that displays only that drive.

You can do this by clicking New, then clicking Shortcut, then typing C:, for example, on the command line; or you can open a copy of Explorer, right-click the various drives you want easy access to, one at a time, and drag them onto the new drive window you have created, choosing Create Shortcut Here.

You can make your access even faster by assigning keys to the shortcuts. Right-click a new shortcut in the Drives folder, then choose Properties and Shortcut. Now you can put in a keyboard shortcut that will give you instant access to that drive. On my system, I have chosen Ctrl-Shift-Alt and the letter that corresponds to the drive.

MARK SIEGEL
New York, New York

PC MAGAZINE: The default behavior for these handy drive shortcuts is to open a single-pane Explorer window in the root directory of the specified drive. If you'd rather have a standard dual-pane window, all it takes is a bit of minor surgery. Right-click the Start button, navigate to the Drives folder, right-click the first drive shortcut, and choose Properties from the menu. Click the Shortcut tab in the resulting dialog, and change the target string to launch Explorer.

You have three main choices for your target string syntax:

```
explorer /e,C:\
explorer /e,/select,C:\
explorer /e,/root,C:\
```

The first will launch Explorer and open drive C:, displaying its root directory contents in the right-hand pane. The second will launch Explorer and list all drives in the right-hand pane, with drive C: selected. Both of these will permit access to other drives. By contrast, the third command line launches an Explorer window that only permits access to drive C:. You can see an example of this handy "rooted" Explorer view in Figure 1.

After you make this change, the icon for the shortcut will change to Explorer's icon. If you'd rather have an icon that looks like a hard disk, click the Change Icon button on the shortcut page. The "File name" box should already contain SHELL32.DLL, so all you have to do is pick out the hard disk icon from the list below. Modify the remaining drive shortcuts in the same way.

Hidden Files and Folders in The Start Menu

If you're like me, one of the first things you did after installing Windows 95 was to set Explorer to "show all files." Once you do that, the only object left that "respects" hidden files is the Start menu. If you check the Hidden box on the General tab in the Properties dialog of any shortcut or folder within the Start menu folder structure, that item will not appear in the Start menu. Why would you want to hide some things rather than have them appear on the Start menu? I can think of two good reasons:

- When you install a program, a program group is usually created. Chances are you've organized your Start menu in a logical way and that this new group messes up that structure. Also, the new program group may contain some shortcuts that you'll rarely use but can't throw away, particularly those launching uninstall utilities. What to do? Take the main program shortcut and place it in a proper location in the menu structure. Then

move its original folder (the one that contained it) into the same location, and hide the folder. You only have to hide the folder, not everything inside it. The folder will not appear in the Start menu but will be easily found when needed.

- Tracking down a program when you want to launch it can get really annoying. To make things easier, you can assign shortcut keys for each of your favorite applications. (Be aware that this works only for shortcuts on the desktop and in the Start menu.) If you hide a shortcut in the Start menu, it will be activated only when you press the appropriate shortcut keys (or drill down using Explorer). This is a great way to keep programs like RegEdit—which are best kept hidden from the casual user—accessible but not easily available.

In many cases the shortcut will disappear as soon as you mark it as hidden; otherwise simply restart Explorer.

COLIN KASTNER
Chicago, Illinois

PC MAGAZINE: To hide a file or folder within the Start menu structure, right-click the Start button and choose Explore from the pop-up menu. Navigate to the folder in question, right-click it, and choose Properties. Click the Hidden check box, press the OK button, and you're done. As you can see in Figure 2, a hidden file or folder still shows up in Explorer, but not in the Start menu. To open a hidden folder or launch a hidden file, simply navigate to it in Explorer. Or, as this reader suggests, define a hotkey to launch the shortcut.

A newly hidden folder may not immediately disappear from the Start menu, most likely because of caching within the system shell. Your change will definitely take effect the next time you start Windows 95, though.

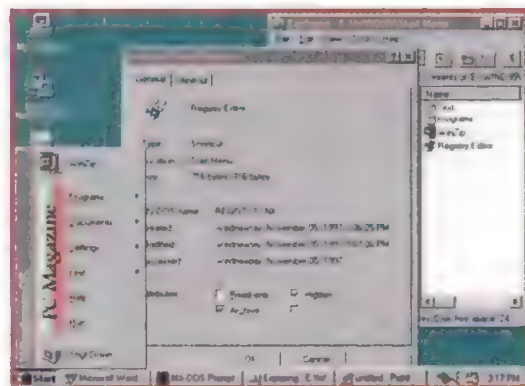


FIGURE 2: Although the hidden shortcut to REGEDIT doesn't show up on the Start menu, it's completely accessible in Windows Explorer.

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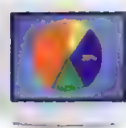
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DAVE NEATE
via the Internet

PC MAGAZINE: There are a couple of ways to solve your problem. The most obvious would be a printer switch, but for a number of reasons, it may be better and cheaper to add a second parallel port.

There are all sorts of printer switches available, ranging from inexpensive mechanical A/B switch boxes to sophisticated—and expensive—electronic switching devices that include data buffering and other features. The situation Mr. Neate describes could be well served by the simpler solutions. For less than \$20, you can get a manual switch box plus the cable you'll need to connect it to your computer. You can use your existing cables to connect the printers to the switch box.

There are some pitfalls to that approach, however. The electronic controller circuitry inside your printer is the most expensive component to repair or replace and the most susceptible to damage from power surges or similar mishaps. If the switch box is poorly designed or assembled, it is possible that when you turn the switch, one or more wires may still be connected when contact is made in the new position. That could result in unwanted voltage being sent up a wire, possibly damaging one or both printers or your computer's port.

Another problem comes from the advanced expectations of modern printers. Many of the newer designs rely on bidirectional communications with the computer to exchange information about printer configuration and operational status. The communication link is broken when you switch from one printer to the other, and you may have to reboot your machine in order to reestablish communications. That completely wipes out any convenience offered by the switch box. Although such a problem is unlikely with a dot matrix printer, it could be a factor with the ink jet printer.

Finally, some printer manufacturers have warranties that do not cover damage caused

when the printer is connected to a manual switching device. That is often the case with laser printers, which may be a consideration for you if you have plans to upgrade in the near future.

For about the same \$20 you can get an additional parallel port that supports the latest high-speed bidirectional modes. You don't have to be concerned about communications with your printer or possible damage when switching. All you need is an available slot in your system. This solution has the added advantage of making it possible to use both printers at the same time; as a long print job is being spooled to your dot matrix printer, you will still have access to your ink jet for other print jobs.—*Alfred Poor*

Pointed Advice

I have a new system with a keyboard that includes a touch pad. I like the keyboard, but would rather use a standard mouse as a pointing device. Unfortunately, in order to get Windows 95 to detect the keyboard, both the keyboard and the touch pad cables must be plugged into the keyboard and mouse ports. Is there a Y connector I could get for the mouse port? Or is there any other way around this problem?

JOHN BURGNER
via the Internet

PC MAGAZINE: You can find dual mouse adapters for PS/2 mouse ports, for about \$50 apiece, but there is another solution that may not cost you anything.

One of the handy features of Windows 95 is that it will let you have more than one pointing device installed and active at the same time. If you have an external COM port available, your best fix is to add a standard serial mouse to your system and use that; it's practically a no-cost solution (assuming you have not already purchased the mouse) and is certain not to interfere with the recognition of your keyboard.—*Alfred Poor*

OPERATING ENVIRONMENTS

Where Do .CHK Files Come From?

After using ScanDisk and Defrag, I noticed at least 75 files using about 12.4MB of disk space, with names like File0000.chk. There seem to be two groups of these files, with

dates corresponding to when I used these programs. Can I safely delete the files without messing something up?

RONALD BUSSING
via the Internet

PC MAGAZINE: Files with names matching the file specification File????.chk are created by ScanDisk. They contain clusters of data that were marked as in use in the file allocation table but were not actually allocated to any file. These lost clusters are formed when your system crashes while programs have files open, or when you shut down the system without going through the shutdown procedure on the Start menu. Occasionally the .CHK files will contain part or all of a file you were working on at the time of a system crash or power failure.

It's best to look for .CHK files in the root directory of each drive just after you run ScanDisk. You can load the .CHK files into WordPad or Windows Write to look at their contents; sometimes they will contain recognizable text that you can salvage. To be honest, though, I have never found anything useful in a .CHK file. Unless I know that I have

OUR ADVISORS

Alfred Poor is a contributing editor and the author of *The Underground Guide to Hardware*.

Brian Proffit is a contributing editor of *Computing Today* and the author of *OS/2 Warp Survival Kit*.

Sal Ricciardi is a contributing editor and the author of the *Running Fox-Pro* series from Microsoft Press.

Neil J. Rubenking is technical editor and author of *Delphi Programming for Dummies*.

Luisa Simone is a contributing editor and the author of *Microsoft Publisher by Design*.

Craig Stinson is a contributing editor and the coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and the coauthor of *Word for Windows Companion, Second Edition*.

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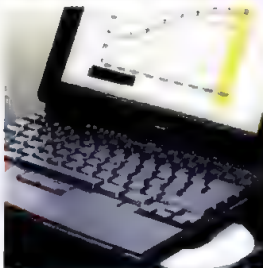
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PCTech Ask Our Advisors

lost a file in a system crash, I simply delete the .CHK files without looking at them.

—Neil J. Rubenking

Lost Disk Space?

I've got a question about disk capacity. My relatively new Windows 95 machine has a 2.1GB hard disk. If I look at the disk's properties in Windows, it shows a capacity of 2,109,472,768 bytes, or 1.96GB (that's fine, I know some space is lost in formatting). Used space is 2,014,085,120 bytes (1.87GB), and free space is 95,387,648 bytes (90.9MB), totaling roughly the expected 1.96GB.

That math adds up, but in Windows Explorer, things don't seem to work the same way. When I view all file types, select all files and folders, right-click, and select Properties, Explorer reports 1.36GB (1,469,809,062 bytes), not the 1.87GB reported in the hard disk properties. ScanDisk found no problems, so I'm not sure what's happened to the other 510MB. I could really use it. Any ideas?

MICHAEL GARDINER
Mountain View, California

PC MAGAZINE: Hard disk space is allocated to files in units called *clusters*, and a disk can't have more than 65,536 of them, a limitation of the FAT-based file system. Large hard disks have large clusters—double the size of smaller disks', or in your case, 32K.

Effectively, you're averaging 16K or more of wasted space for every file on your disk. That's because the amount of disk space used by a file is the file's size rounded up to the nearest 32K. A 1-byte file takes up 32K on disk, and a file whose size is 32K+1 byte takes 64K. The average waste may be even more than 16K per file, because typically file sizes are not distributed evenly, and very small files are over-represented. But if we assume 16K wasted per file, your missing 510MB are fully accounted for if the disk has about 32,600 files.

One thing you can do is partition your disk into several logical drives. As cluster size gets smaller, the amount of wasted disk space diminishes substantially. Repartitioning used to be a horrible, barely thinkable task, but with modern utilities like PartitionMagic and Partition-It, you can repartition with very little pain. One warning: Repartitioning can be very slow on a nearly full disk. You may want to clear out any unnecessary files before beginning.—Neil J. Rubenking

Cleaning Up Orphan Icons

Here is something that is driving me nuts. Sometimes icons become orphaned in the Windows 95 Control Panel. For example, I recently replaced my sound card, but the icon re-

mains visible on the panel. Of course, the icon is of no use at this point; in fact, it doesn't even work. I'd like to get rid of it, but I can't seem to find out how. Can you help?

GEOFF ROWDEN
via the Internet

PC MAGAZINE: Quite a few readers share your feelings. Control Panel looks in the Windows System directory when it starts and loads all of the .CPL files it can find. Each .CPL file contains one or more Control Panel applets. To clean up your orphan applets, you simply need to locate and remove the .CPL file that

To clean up your orphan applets, you simply need to remove the .CPL file that contains them.

contains them. Try using the *Find Files* option from the Start menu. Set it to look in the Windows System directory for files matching *.cpl, then flip to the *Advanced* page and enter the name of the offending item in the *Containing text* box. If a file is found, rename it to have a different extension. If not, keep trying with other possible words or phrases.

Now launch Control Panel, or if it is already open, select *Refresh* from the View menu. Make sure that only the "wrong" Control Panel item has disappeared. If so, you can delete the renamed .CPL file. If not, restore the extension of the renamed .CPL file and keep looking.—Neil J. Rubenking

WORD PROCESSING

Foldover Booklets in Word 97

In the October 7, 1997, issue, you discussed a macro for foldover booklets for Microsoft Word 6 and Word 7. I tried installing the macro in Word 97 and ran into all sorts of problems. Is there an equivalent macro that works in Word 97?

DARRICK WONG
via the Internet

PC MAGAZINE: Several readers asked about a Word 97 equivalent for this macro. Unfortunately, most nontrivial WordBasic macros don't translate to Word 97's VBA macro language very well. In this case, however, you don't need to use a macro. In Word 97, templates provide a better approach—at least

for booklets with up to 32 pages.

Word 97 will let you link text boxes, so text that won't fit into one box can automatically flow to the linked box or flow back to the first box if you delete some text. An obvious application of this feature is a newsletter, where a story on page 1 might continue on, say, page 4. You can also use it to link text boxes as booklet pages.

To create a booklet template in Word 97, choose *File | New*, choose *Template* in the *Create New* box in the lower-right corner of the dialog, and choose *OK*. To set the template to landscape mode, choose *File | Page Setup*; on the *Paper Size* tab, set *Orientation* to *Landscape*, and then click *OK*. Next add as many document pages as you need. For example, if you're creating an eight-page booklet, you'll need four document pages. Press Ctrl-Enter three times to add three page breaks and create the second, third, and fourth pages. Then move the cursor back to the first page.

The next step is to add the text boxes. You'll find it easier to add them, however, if you first make sure you're in *Page Layout* view (choose *View | Page Layout*) and also adjust the zoom so that you can see a whole page at once. (Choose *View | Zoom*, select *Whole page* in the *Zoom to* box, and choose *OK*.) If necessary, scroll so that you can see the whole page. In addition, you'll want to be able to see the anchor symbol that shows which paragraph the text box is anchored to. Choose the *Show/Hide* button in the standard toolbar or Ctrl-Shift-* to toggle the nonprinting characters on and off.

If the drawing toolbar isn't showing, choose *View | Toolbars*, and select *Drawing*. Then click on the *Text Box* icon (which looks like a thumbnail sketch of a text page). Use the mouse to draw a text box at approximately the right position and size for the booklet page on the left side of the first page. Once you've drawn it, select it, choose *Format | Text Box*, and define the position and size exactly the way you want them.

The next step is a little tricky. There are two ways to select a text box. If you move the mouse inside the box and click, you'll see the box selected with a shaded frame around its edge to indicate the selection. If you move to the edge of the box, the mouse pointer will change to a mouse arrow plus thin arrows in a four-points-of-the-compass arrangement. If you click then, you'll see an outer frame of handles around the edge to indicate the selection. Only the second kind of selection will let you copy and paste the text box.

Select the box so that you see the frame of dots, and choose *Edit | Copy*. Then click anywhere outside the box to deselect it, and

choose *Edit | Paste* to insert a copy of the box. Drag the copy to approximately the right position on the right side of the page, select it, and choose *Format | Text Box* to adjust the position exactly the way you want.

You can now copy the two boxes to the other pages. Select either one so you can see the outer frame of handles. Then hold down the Shift key while you select the other. Choose *Edit | Copy*, click on the page anywhere outside the boxes, move the cursor to the next page, and choose *Edit | Paste* to paste two text boxes onto the second page. Click on the second page anywhere outside the text boxes, move the cursor to the third page and choose *Edit | Paste*, then repeat these steps for the fourth page.

At this point you'll have two text boxes on each page. This is a good time to save the file. Use a name that indicates the number of pages, like 8-Page Booklet.dot. As you'll see in a moment, you'll need a different template for each booklet size you use.

With the text boxes in place, you're ready to link the boxes in the right order. This requires some thought, because you need to link the text boxes in booklet-page order. On an eight-page booklet, for example, the layout for the booklet pages is:

Page 1: 8 1
Page 2: 2 7
Page 3: 6 3
Page 4: 4 5

The easiest way to figure out the layout is to use a dummy booklet. Take as many blank sheets of paper as will be in the booklet — two sheets for an eight-page booklet. Fold them in booklet format, number both the real pages and the booklet pages, and then take the booklet apart to see the layout.

Once you know the layout, linking the boxes is easy. Select the first booklet page. Click on the *Create Text Box Link* button in the Text Box toolbar, then click on the text box you want the text to flow to. Repeat these steps for each link. When you're finished, select all the text boxes, choose *Format | Text Box*, then choose *Colors and Lines*, and remove the borders from the booklet pages by setting the line color to *No Line*.

You may also want to add page numbers in the top or bottom margins of the document pages, outside the text boxes. Add these as actual numbers, not as number fields. The numbers will be the same for all booklets of a given size, so you don't need to worry about changing numbers.

Note that you can create a maximum of 31 links, for 32 booklet pages, which should be

enough for most purposes. Note too that you'll need separate booklet templates for 8, 12, 16, 20, 24, and 32 pages, since the order for links will change depending on the number of pages. However, you'll only need to create a booklet for each size once. After you save the template, you can create a booklet by choosing *File | New* and selecting the appropriate booklet as the template for the new file.

You can use the templates in either of two ways. One choice is to create a document in another file, based on a nonbooklet template, then copy the text and paste it into the first text box (meaning booklet page 1) of a blank booklet document. Word will flow the text to the correct booklet pages. The other choice is to create the text in booklet format in the first place. Just be sure that you start typing in booklet page 1, which is on the right side of the first document page. Simply create a new file, click anywhere on the text box, and start typing.—*M. David Stone*

SPREADSHEETS

An Expandable Entry Range For Use as a Chart Source

I update an Excel spreadsheet weekly to reflect new stock prices. I have charts linked to the data, but I need to extend the range of the charts manually each time I add a new line of information.

I imagine there must be a way to update these links automatically, or at least with more ease than the manner in which I am now doing it. Do you have any suggestions?

J. HORIZNY
Purdys, New York

PC MAGAZINE: Here's one method you can use:

1. Assign the name *database* to the entire block you're plotting, including the header row.
2. Assign names to each column within the block, but instead of assigning the names to absolute addresses (for example, \$A\$2:\$A\$100), use a formula based on the INDEX function. For example, for the first column, use this:

```
=INDEX(database,2,1):INDEX(database,  
ROWS(database),1)
```

This assumes that the first row of *database* is a header row, not to be plotted. If that assumption is incorrect, replace the 2 in the second argument of each INDEX function with 1.

For the second column, replace the 1 in the third argument of each INDEX function with 2, and so on.

3. For each column plotted in your chart, re-

place the current cell-coordinate addresses with the range name you've assigned to that column. For example, if your first column is now named *Date*, replace the cell coordinates assigned to the corresponding chart series values with the name *Date*.

In Excel 97, select the chart, choose *Source Data* from the Chart menu, and click the *Series* tab. Select the series name or number for which you want to make the replacement. Then, in the *Values* edit box, replace the coordinate address with your range name. Be sure to replace only the part that comes after the exclamation point.

In Excel 5, double-click a chart marker for the series whose address you want to modify. In the *Format Data Series* dialog box, click the *Name and Values* tab. Then replace the coordinate address with your range name in the *Y Values* edit box.

4. Whenever you add new data to the chart, use the *Data Form* command instead of entering data directly on the worksheet.

The *Data Form* command is designed to work with a range named *database*. If you add new data via the *Form* command, Excel automatically redefines the name *database* to encompass the added data.

The INDEX function, in combination with the ROWS function, lets you define a range dynamically. For example, the formula cited above returns the range that begins with row 2 of column 1 of *database* and extends to the *n*th row in column 1 of *database*, where *n* is the number of rows in *database*. Any time you add data to *database*, the name you defined via that INDEX formula is updated to include the new row(s).

The *Form* command and your INDEX formulas keep all your name definitions in step with your data; assigning names to your chart ranges, instead of cell coordinates, keeps the chart in step as well.—*Craig Stinson*

DATABASES

Incremental Search-as-You-Type Input

How can I create a "search-as-you-type" style query like the one used by Windows help menus or products like PhoneDisc? I'd like to do this in Microsoft Access and with other products, but I'm not sure how to implement it.

BEN HAMMOND
Montgomery, Alabama

PC MAGAZINE: The easiest way to do this in Microsoft Access is to place a combo-box control on your form. The combo box opens

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```
Option Compare Database
Option Explicit
```

```
Private Sub ctlProductListBox_AfterUpdate()
    ctlProductTextBox.Value = ctlProductListBox.Value
End Sub
```

```
Private Sub ctlProductTextBox_Change()
'-----
' Position the ctlProductListBox to the item that
' matches the text in ctlProductTextBox.
'-----
Dim dbsCurrent As Database
Dim rstProduct As Recordset
Set dbsCurrent = CurrentDb()

' Create a recordset on the rowsource for the listbox.
Set rstProduct = dbsCurrent.OpenRecordset
(ctlProductListBox.RowSource, dbOpenDynaset)
```

```
' Search for a match on the text in the text box
rstProduct.FindFirst "[ProductName] >= " & """" &
ctlProductTextBox.Text & """"
```

```
If Not rstProduct.NoMatch Then
    Me!ctlProductListBox = rstProduct("ProductName")
End If
```

```
rstProduct.Close
End Sub
```

```
Private Sub ctlProductTextBox_Exit(Cancel As Integer)
    ctlProductTextBox.Value = ctlProductListBox.Value
End Sub
```

```
Private Sub ctlProductTextBox_GotFocus()
    ctlProductTextBox.Value = ctlProductListBox.Value
End Sub
```

FIGURE 1: The code shown here can be used with a text box and a list box to implement an incremental-search entry field like the one shown in Figure 2.

when you click on it and closes when you're done, and it automatically provides search-as-you-type support. If you want something where the list portion stays open all the time, you can use a text box and a list box along with the code in Figure 1.

Here's what the code needs to do: When the user changes the text in the text box, search for matching text in the data source that underlies the list box (for example, a products query). If a match is found, scroll the list to that item. Then return control to the text box.

Figure 2 shows an example form with an incremental-search field implemented using a text box and a list box. When you type a letter in the text box, you trigger the text box control's Change event. The Change event code, named `ctlProductTextBox_Change`, is shown in Figure 1. The code creates a `RecordSet` based on the row source used for

the list box. The `FindFirst` method is then used to search the `RecordSet` for a `Product-Name` that matches the text entered in the text box. If a match occurs, the list box is reset to the matching item. Then the `RecordSet` is closed, the code ends, and control returns to the text box.

To make sure the text box and list box always remain in sync, you should add code to the text box's `Exit` and `GotFocus` events and the list box's `AfterUpdate` event to assign the list box's current value to the text box. Figure 1 shows the code required to do this in our example database.

If your list box is going to be based on a large number of items from a table instead of a query, you'll get better performance if you use an index and make a few changes to the code. First, make sure your table has an index on the field you're going to use for the list box.

Then make the following changes to the Change event code in Figure 1:

1. In the line that opens the `RecordSet` using the `OpenRecordSet` method, change the options argument from `dbOpenDynaset` to `dbOpenTable`.
2. Add code to set the index. For example, if the `Products` table has an index on `Product-Name`, add the following line immediately after the line with the `OpenRecordSet` method:

```
rstProduct.Index =
"ProductName"
```

3. Change the method used to perform the search from `FindFirst` to `Seek` to make use of the index by replacing the line containing the `FindFirst` method with the following:

```
rstProduct.Seek ">=",
ctlProductTextBox.Text
```

This example code can be downloaded from PC Magazine Online. (See the sidebar "Getting the Files" in this issue's Utilities column for downloading instructions.) Look for the Access 97 database file named `Incsch.mdb` in the issue archive file.—*Sal Ricciardi*

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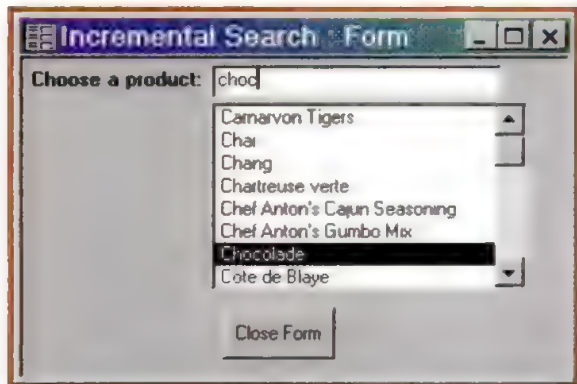


FIGURE 2: The text box and list box shown here form an incremental-search entry field when used in combination with the code shown in Figure 1.

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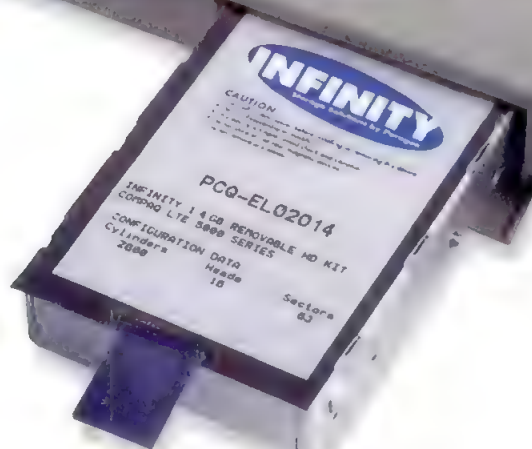
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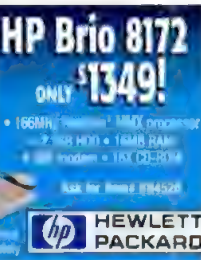


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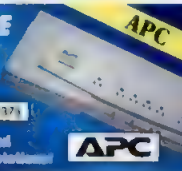
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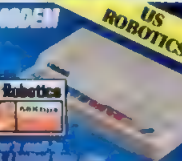
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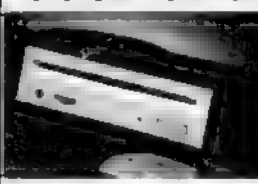
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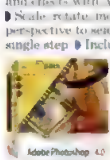


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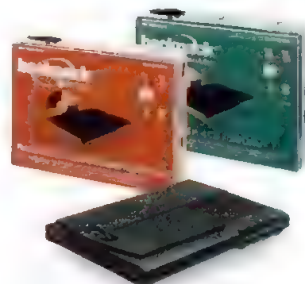


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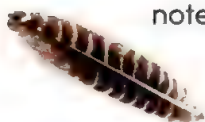
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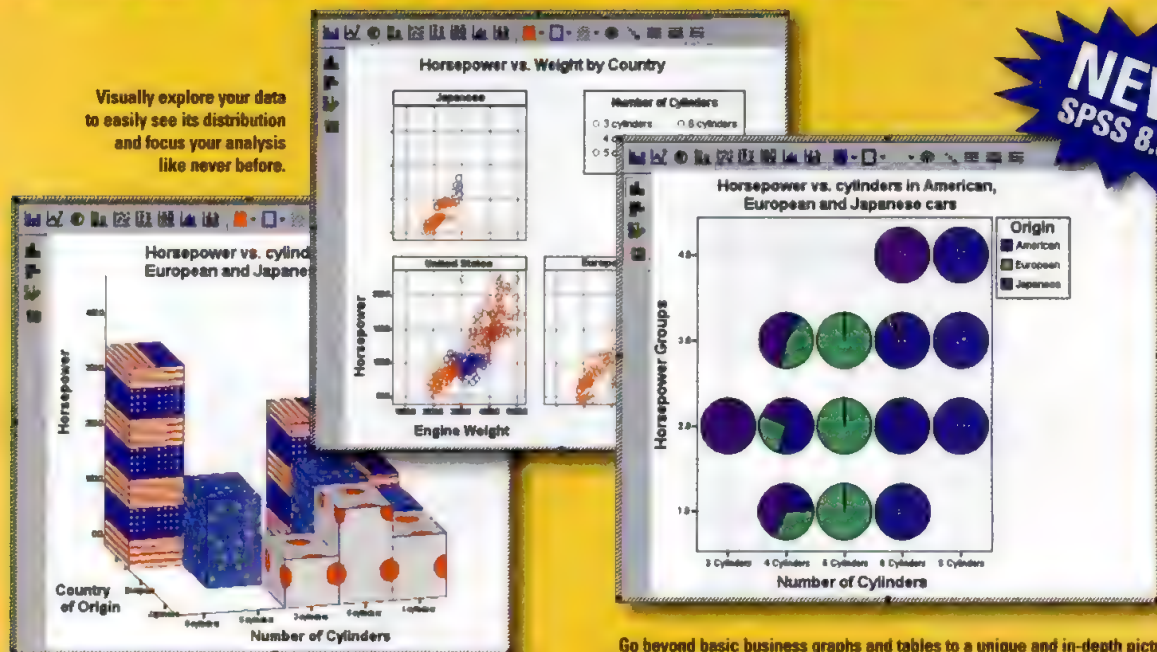


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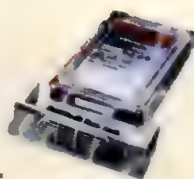
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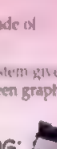
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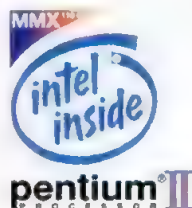
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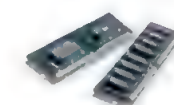
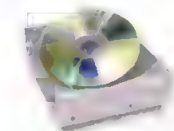
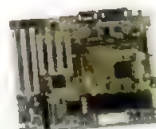
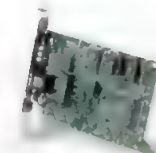
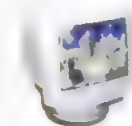
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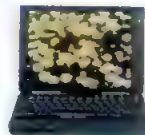
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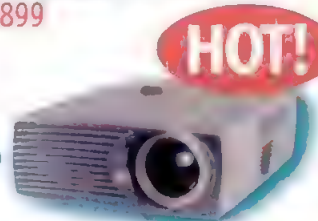
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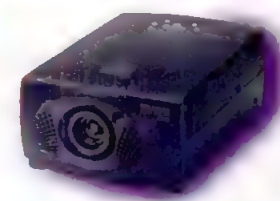
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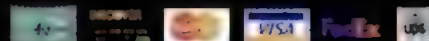


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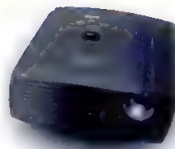
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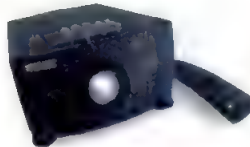
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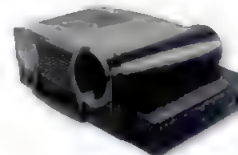
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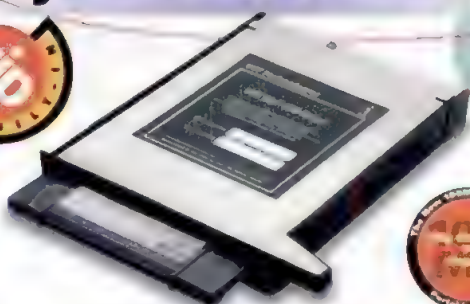
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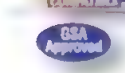
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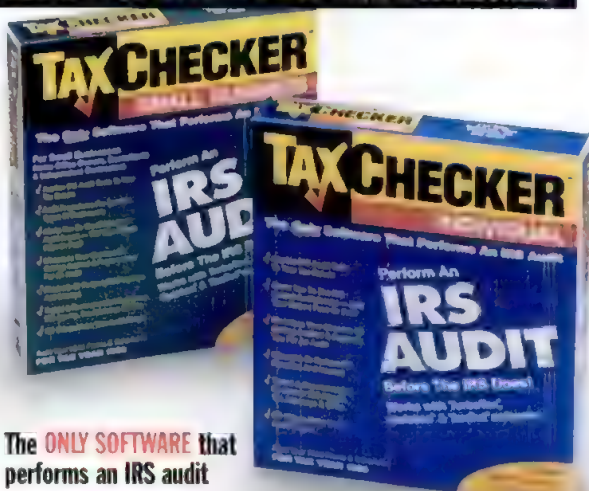
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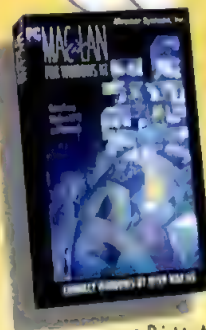
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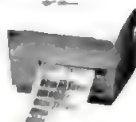


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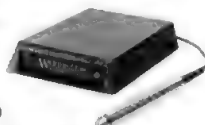
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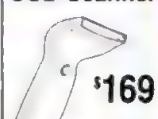


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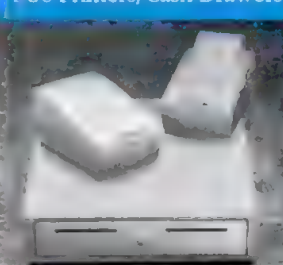
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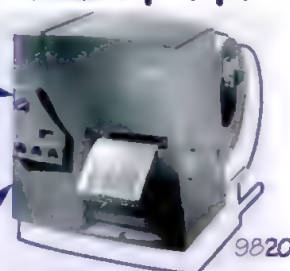


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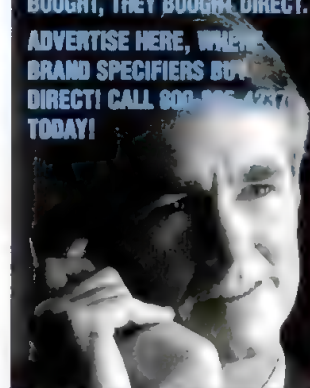
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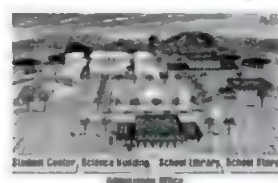
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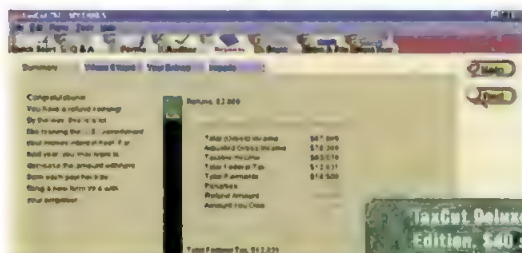
After Hours

Taming the 1040

TurboTax Deluxe and TaxCut Deluxe help you navigate those tough IRS forms.

By Kathy Yakal

And then there were two. The personal tax-preparation software field has dwindled to a pair of worthy competitors: Intuit's TurboTax Deluxe and Block Financial Corp.'s Kiplinger TaxCut Deluxe Multimedia Edition. Parson Technology's Personal Tax Edge is no more, and Simply Tax is now being handled by a discount distributor called CD Titles. It comes with a free copy of Simply Money, a personal finance program, for the bargain-basement price of \$10, postage-paid (www.cdtitles.com, 617-642-1700). Simply Tax has no multimedia bells and whistles and offers a fraction of the tips and support featured in the other two programs, which is why we did not include it in this roundup.



The biggest change this year is that there are no head-start editions. Intuit and Block Financial Corp. each released only the final versions of their programs this past December. There are two reasons for this strategy, according to the folks at Block Financial Corp.: the desire to have the product on store shelves for the holiday

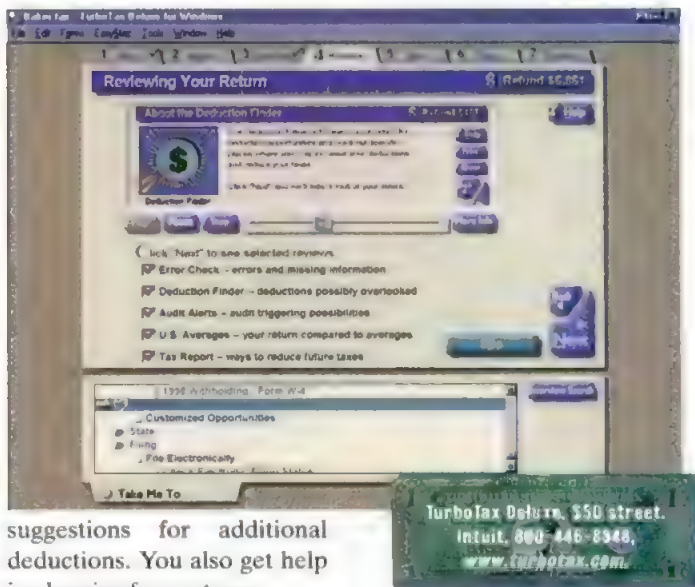
buying season and the fact that many of the new tax laws were not enacted soon enough to warrant an early edition of the software. Last-minute tax-law changes and program updates will be handled via a disk or a Web download. Here's a head-to-head comparison of how the two programs stack up in several key areas.

Getting Started

We tested beta versions of both TurboTax Deluxe and TaxCut Deluxe. Although both programs have tweaked and added features, what we saw was not a whole lot different from last year's offerings—and that means that TurboTax Deluxe once again came out on top. Both products simplify tax preparation by offering a hand-holding interview option that asks you questions and deposits the answers in the right



places on IRS forms and schedules. Regardless of which program you use, you'll have an abundance of guidance in the form of text, multimedia clips, links to related Web sites, and a final review process that combs your return for errors, flags potential problems, and offers



suggestions for additional deductions. You also get help in planning for next year.

The filing options are the same as in previous years: You can print and mail the form, use the abbreviated 1040PC format, or file electronically. TurboTax Deluxe and TaxCut Deluxe have eliminated the electronic filing fees; you can now file one complete form for free.

Both programs have multi-state editions, for a street price of approximately \$25, for filing state tax returns. And Intuit offers a souped-up version of its product for small businesses called TurboTax for Business (\$70 street).

Unless you require the services of a professional tax guru (perhaps you itemize and deduct so many things that filling out your own forms would make your head spin), you'll likely find that personal tax-preparation software will make your April 15 ordeal more organized, more understandable, and maybe even less expensive. You won't necessarily bring the 1040 to its knees, but you might be able to make it whimper a little.

Preparing Your Taxes

TaxCut Deluxe Multimedia Edition competes well with TurboTax Deluxe in terms of tax-preparation tools and conventions. As in past versions, both offer two options for data entry. You can enter information directly on the forms and schedules, or you can opt to use the interview, a Wizard-like tool that interprets the forms, asks you questions, and deposits your answers in the right fields. This process is called EasyStep in TurboTax

INSIDE

Audit-Proof

New software to help you avoid the IRS inquisition. Page 290.

Laying Down the Law

Changes in the tax laws that you should be aware of. Page 294.



After Hours

Deluxe and Q&A in TaxCut Deluxe. Both programs offer a sufficient number of IRS forms and schedules to meet the needs of most individuals and some small businesses.

There are subtle yet obvious differences between the two programs that are evident early on. Although you can import data stored in personal finance programs such as Money and Quicken, using the standard .TXF format, this process is easiest if you're using the combination of Quicken and TurboTax Deluxe (Intuit sells the Quicken bundle, which includes Quicken Deluxe 98, TurboTax 1997, and Quicken Financial Planner, for \$80 street). With TaxCut Deluxe, you must export two reports from Quicken before it can grab the numbers and deposit them in their correct spaces, but TurboTax Deluxe asks only for the name of the file. TurboTax Deluxe's TaxLink feature lets you view all of your Quicken transactions by category, and confirm or change the area in which they will be dropped in the tax software—all before you actually import the data.

The tax preparation process is far from linear, yet both TurboTax Deluxe and TaxCut Deluxe have developed effective vehicles to move taxpayers

Editors' Choice

• TurboTax Deluxe

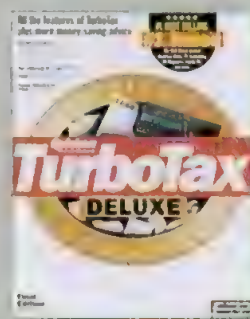


It's déjà vu all over again: For the third year in a row, Intuit's

TurboTax Deluxe stands as the best product in the shrink-ing field of tax-preparation

programs. Although Kiplinger TaxCut Deluxe is an able competitor, TurboTax Deluxe goes the extra step toward ensuring that your returns will be completed without errors to catch an IRS auditor's eye and with a minimum of hassle and headache for you.

From the ease with which you can import financial data



from Money or Quicken, to the well-integrated videos that help you along the way, to the Web reminders that prompt you to check for tax-law updates on the Internet, TurboTax Deluxe addresses your needs from start to finish. Its sleek, intuitive interface frames not only all the forms and schedules necessary to complete a return but a wealth of additional resources as well. With all this information, the program might easily appear cluttered or confusing, but TurboTax Deluxe is neither. Its

easy-access help function offers context-sensitive information with links to related material.

For the the seasoned pro as well as the first-timer, tax time can be overwhelming. TurboTax Deluxe offers a strong lead line through the IRS mire, and for that reason, it is our Editors' Choice.

through the labyrinth of paperwork. Both have finally made it easy to toggle between the direct-form entry and the interview without losing your place, and both clearly earmark fields that require official supporting documentation (such as the W-2 form required to back up claimed wages).

TaxCut Deluxe has added a feature to its program this year that TurboTax Deluxe has used for years. Called Fast Lane, it's a slightly different version of

TurboTax Deluxe's Fast Track. Both use an interview format to allow savvy taxpayers to bypass unrelated portions of the interview by defining income and expenses up front.

Other tools required for tax preparation are handled competently by both programs. TurboTax Deluxe offers a bit more flexibility as it walks you through your return using EasyStep. The interview question and answer blanks appear at the top of the screen, and you can toggle between the related form or schedule and a list of interview topics by clicking tabs at the bottom. TaxCut Deluxe displays its Q&A

in whatever order you please.

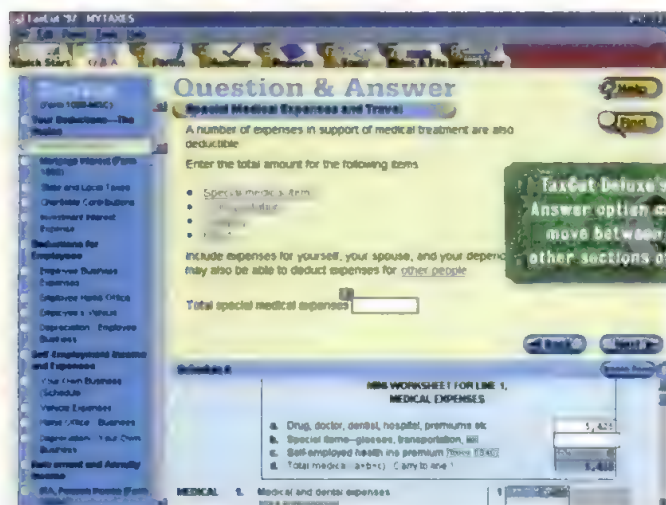
Both programs offer two important update features, one included with the program and the other available on the Internet. As you work on your return, you have access to summaries of your current bottom-line numbers.

If you have an Internet connection, you can click on a menu item or button to connect to each company's Web site and grab program updates and tax-law changes. TurboTax Deluxe is better at prompting you to do this than TaxCut Deluxe.

A Helping Hand

Once again, TaxCut Deluxe does everything TurboTax Deluxe does, in terms of providing guidance to taxpayers. However, TurboTax Deluxe does everything at least a little better, more thoroughly, and with slightly more style.

Maybe one of the reasons you're considering using a tax program is to avoid those dry, complex IRS instructions. The



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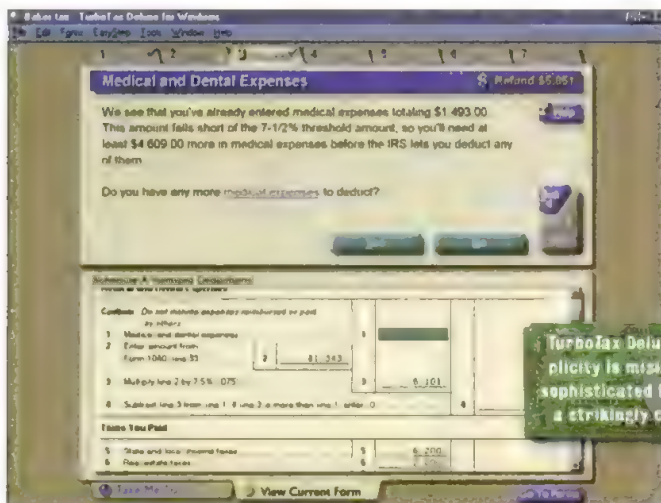


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programs put a friendly interface between you and the official IRS instructions, but should you need them, they're available in both packages. Also on hand are dozens of IRS publications that go beyond the scope of the basic 1040 instructions and deal with

very specific—and not always common—tax situations. Tax-Cut Deluxe includes advice from the Kiplinger organization in the forms of general tips, advice related to planning for next year, and specific advice related to dozens of forms and schedules.

TurboTax Deluxe includes the text of *Money Magazine's Income Tax Handbook*, Jeffrey Schnepfer's *How to Pay Zero Taxes*, and a tax Q&A section. Both programs centralize their resource information. Click the **Help** button and a dialog box opens, divided by tabs into individual sections.

In the beta version of TurboTax Deluxe that we tested, each tab usual-

ly revealed a content-sensitive reference, which was not the case with TaxCut Deluxe.

Some of the offered guidance is sprinkled throughout the programs' preparation processes and pops up unbidden at appropriate times. One of these aids is the series of multimedia clips that appear in various places throughout the pro-

grams, featuring recognized financial experts along with additional presentation graphics and audio. Intuit has implemented the clips very well in TurboTax Deluxe, after several years of refining. The multimedia clips are encased in viewing boxes whose look and controls blend well into the program. Content is generally a blend of a few pithy statements, references to parts of your tax return, and suggestions for further study. Although the advice imparted in TaxCut Deluxe's multimedia clips is certainly sound, its presentation suffers in comparison.

In addition, TurboTax Deluxe and TaxCut Deluxe interrupt you occasionally if you've entered a questionable number, or when you've encountered a situation that is either very complex or may cause

Tax Software Puts You in the Auditor's Seat

If there's anything scarier than an unexpectedly hefty tax payment due on April 15, it's the prospect of an IRS audit. A company called, nobly enough, Tax Defenders (213-977-1120, www.taxchecker.com) has a new program entitled Tax-Checker that scrutinizes the data in your tax return and performs the same tests an IRS auditor would. Besides determining your chances of being audited, it helps prepare you for a potential audit. Finally, the program helps you avoid or reduce penalties and provides income and tax-projection tools.

TaxChecker is clearly not a competitor with TurboTax Deluxe and TaxCut Deluxe. It does not provide their step-by-step guidance, preparation, or filing capabilities. But TaxChecker goes far beyond these programs in terms of

audit education and advice.

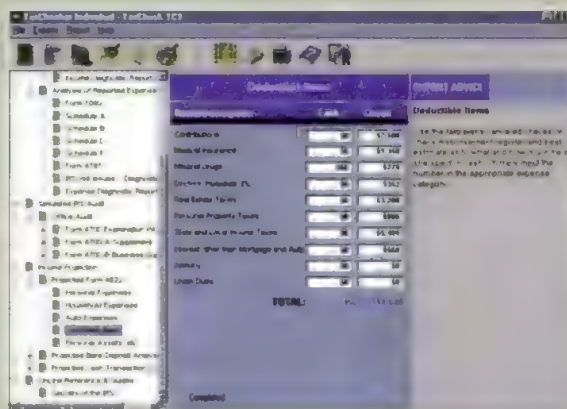
You can import income and expense data into the program from Quicken, TurboTax, and TaxCut Deluxe, or you can enter it manually. TaxChecker uses an Internet Explor-

activate either a data entry section or an informative video featuring advice from the experts.

Several areas of the return are scrutinized, including your reported income, cash transactions, deductions, and credits. Three types of audits are covered: correspondence audits (taxpayers are alerted to changes via the mail), office audits (performed in an IRS office), and field audits (performed in your home).

Four versions of TaxChecker are available, two of which will be of interest to individuals and small-business owners. The other two are high-end corporate versions. TaxChecker Individual will have a street price of \$50 and is aimed at individuals filing 1040 returns.

Small-business owners can purchase TaxChecker Small Business for \$90 (street).—Kathy Yakal



A little knowledge can be a wonderful thing: TaxChecker gives you a thorough behind-the-scenes look at a tax audit.

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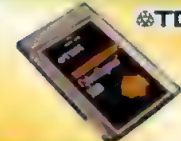
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you problems with the IRS. TurboTax Deluxe's Tax Advisor and TaxCut Deluxe's Live Auditor are welcome features, but we would like to see them used more extensively.

Unless you're the kind of person who just wants to forget about taxes until it's time to file the next round, you may glean some insight from the programs' basic planning tools. TurboTax Deluxe builds a tax report for you containing suggestions on how to minimize your tax obligation based on your current return and tax law changes taking effect in 1998. The program's What-if? worksheet can also help you project specific scenarios, such as what would happen to your tax return if you got a huge raise or had twins. TaxCut Deluxe also offers a What-if? worksheet.

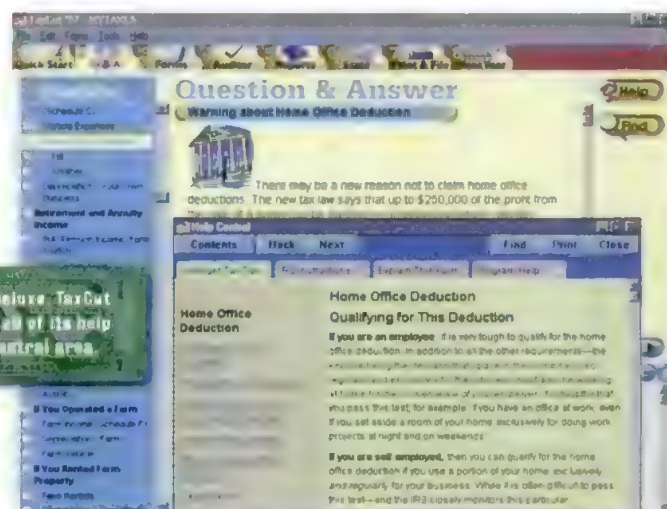
Neither program breaks in and suggests a Web link at appropriate places in the program, but both offer additional

resources on their respective Web sites—free of charge. TurboTax Deluxe's site is far more thorough, offering additional support for the product, tax news and tips, interactive tools such as a tax estimator and messages boards, and links to related sites.

TaxCut Deluxe's Web site was not yet updated for the 1997 tax year at this writing, but its 1996 presence offered little more than product information and technical support.

Yikes—an Audit!

Don't expect personal tax-preparation software to save you from an IRS audit: In most cases, it can't. What it can do is throw up flags when it recognizes obvious situations that commonly trigger an audit—claiming a \$30,000 charity deduction on an income of \$60,000, for example. Both



products check for blatant problems, but look to TurboTax Deluxe for a more thorough evaluation of your return.

If you've forgotten to fill in a required field or entered an unacceptable Social Security number, both programs will gladly point this out to you during the final review session. TaxCut Deluxe alerts you as soon as you make an

invalid entry in the preparation process by asking you to reevaluate your entry. If you don't correct it then, the error will be pointed out in the first of TaxCut Deluxe's three-part review process. The program first checks for missing and incorrect information, then looks for overridden entries and less obvious errors (like wages entered but no income

Tax Relief for Everyone: New Tax Laws for '98

You'll find more changes than usual incorporated in your 1997 1040 form and related schedules, thanks to the Taxpayer Relief Act of 1997. Whatever your economic situation, you're likely to benefit at least a little from one or more of these new regulations. Some have been set in motion for the 1997 tax year, and many more will kick in during the next few years. The \$150 billion in tax cuts will be paid for in part by tax increases for the airline and tobacco industries.

The new provisions are spelled out in the tax programs we reviewed and at sites like www.irs.gov (the IRS site). Following are a few highlights.

The capital-gains tax rates have been lowered for all income-tax brackets. You'll be able to keep more



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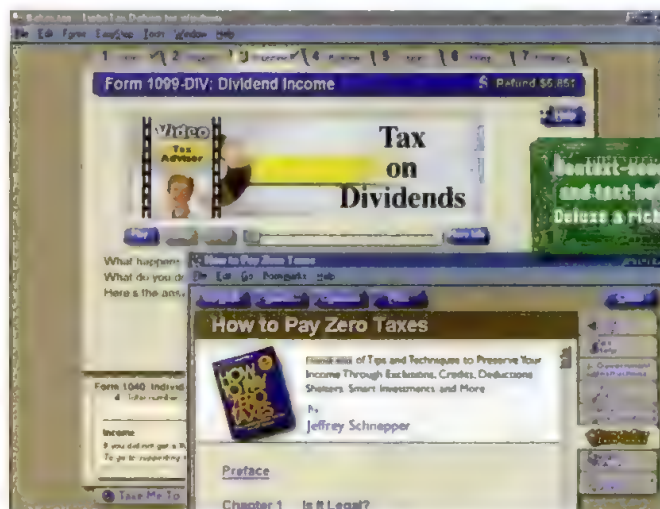
be able to claim a 40 percent deduction for your health-insurance premiums. That rate jumps to 45 percent for the 1998 tax year and will continue to rise until health insurance is 100 percent deductible in 2007.

Changes that will take effect for the 1998 tax year and beyond include the added option of paying taxes by credit card and a redefinition of the tricky home-office deduction to make it easier for some people to claim the deduction legitimately; also to come is a waiving of penalties charged to people withdrawing IRA funds (amounts of up to \$10,000) to buy a first home. The government will also pay for some kinds of education expenses and institute an increased tax credit for families with children.—Kathy Yakal

After Hours

tax withheld). Finally, TaxCut Deluxe offers a few tax-saving tips. Next to each error found in the review process is a button that will take you directly to the appropriate form to correct your mistake.

Beyond these basic review elements, TurboTax Deluxe offers more in its cleanup process. Rather than moving back and forth between the review and affected forms to fix errors, TurboTax Deluxe's streamlined interface lets you stay where you are and, in many cases, make corrections right there. It suggests deductions you may have overlooked (many of these are general and apply to everyone). An audit-alert section points to specific issues in your return and offers information and advice on audits. The program also compares the figures on your return to U.S.



averages as another way of gauging how the IRS might view your return.

Many Happy Returns

In addition to the two programs we tested, here's a quick look at some other helpful tools for preparing your taxes. Both Intuit and

Block Financial Corp. offer versions of their programs that do away with the multimedia extras (and also trim a few dollars off the price). TurboTax 1997 is available on both CD-ROM and disk and has a street price of \$35. The scaled-down version of Kiplinger TaxCut is also available

on both CD and disk and sells for the affordable street price of \$20. There are no discounts for users upgrading from either of last year's products. Both programs are also available

for the Macintosh.

As you plow through your tax forms, you might want to visit an online site that offers electronic filing. The SecureTax (www.securetax.com) Web site lets you file both federal and state returns online. The services are priced at \$9.95 for a 1040EZ and state return and \$14.95 for a 1040 and state return; your electronic filing is aided by on-screen help wizards.

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In the Palm of Your Hand

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Speaking the Truth

The Holy Grail in speech technology—continuous speech recognition—is finally realized in products out on the market. We test whether these packages can really understand you.

CD-R vs. CD-RW

CD-R drives, which let you make your own CD-ROMs, are more affordable. And the new CD-RW drives let you rewrite disks and create read-only titles. We test 24 drive bundles.

Web Site Analysis

What's going on at your Web site? Who's visiting, and for how long? Where are people stopping? We review packages that help you track your site traffic and plan for future needs.



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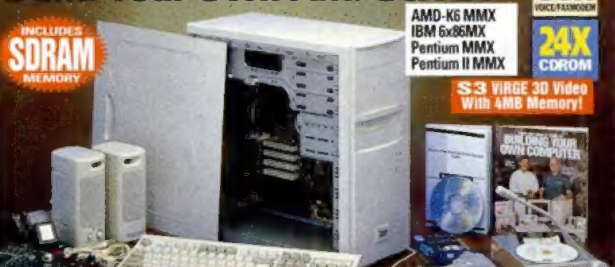
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Item #	Processor	MB	HD Support	Mouse	Price
A13-KT 1	IBM 6x86 PR200+	AT	Ultra	PS/2 Mouse	\$499.99
A13-KT 5	IBM 6x86MX PR233	ATX	Ultra	IntelliMouse	\$679.99
A13-KT 6	AMD-K6 MMX 233MHz	ATX	Ultra	IntelliMouse	\$699.99
A13-KT 7	Pentium MMX 233MHz	ATX	Ultra	IntelliMouse	\$769.99
A13-KT 8	Pentium II MMX 266MHz	ATX	Ultra	IntelliMouse	\$1,049.99
A13-KT 9	Pentium II MMX 300MHz	ATX	Ultra	IntelliMouse	\$1,299.99

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Item #	Memory	Size	Price
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A13-ME 2	SDRAM DIMM (1 module)	32 MB	\$79.99
A13-ME 3	SDRAM DIMM (1 module)	64 MB	\$199.99

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A13-HD 1C	Fast EIDE	1.7GB	\$129.99	A13-HD 3A	Western Digital UDMA	3.2GB	\$209.99
A13-HD 1A	Seagate UDMA	1.7GB	\$149.99	A13-HD 4A	Western Digital UDMA	4.3GB	\$239.99
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J34-1002	4.3 GB	Ultra DMA	11 msec	33 MB/S	5400 RPM	512KB	3.5"	3 years	\$209.99

Western Digital					Maxtor				
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W10-1140	5.1 GB	Ultra DMA	<11 msec	\$249.99*	M122-2006	5.1 GB	EIDE Mode 4	10 msec	\$269.99*
W10-1142	6.4 GB	Ultra DMA	<9.5 msec	\$279.99*	M122-2010	8.4 GB	EIDE Mode 4	12 msec	\$419.99*

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this REX PC
Companion picture?
(Rolodex
Electronics ad.)

An Act of True Faith

"All articles for the November newsletter are due on the Secretary's desk in the Church Office by October 20. If you're using WordPerfect or Microsoft Word..., it's helpful and time-saving to place it on a hard disk. Put your name on the disk and we will gladly return it to you via your church mailbox."—FAITH LUTHERAN CHURCH, ELDERSBURG, MARYLAND

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802. Winners this issue: Jeffrey Cade, Mark Hastings, Wes Lockard, Andrew Parlette, and Naseem Saad.

Software, Software Everywhere

We've been browsing through the downloads at ZDNet's Software Library (www.hotfiles.com), and we've come to the conclusion that yes, there is nothing that software can't do. Three recent examples:

•Bubble Pop

An action game in which your mission is to rescue Bublina and the world from The Evil One, who has turned all your friends against you. Break the spell with your Magic Rod.

•My Cigars

Build a database for your cigars. Enter data in the easy-to-use forms for brands, names, country of origin, wrapper, components, ring size/length, sources and prices. Note where you store it and when; then complete the detailed notes form when you enjoy your smoke to capture your impression of taste, finish, burn, aroma, and more.



•SermonFile

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